TECHNICAL DOCUMENT 2985
January 1998

SSC San Diego Command History Calendar Year 1997

Space and Naval Warfare Systems Center
San Diego, CA 92152–5001

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Preface

The Space and Naval Warfare Systems Center San Diego (SSC San Diego) Command History for calendar year (CY) 1997 is submitted in conformance with OPNAVINST 5750.12E. The history provides a permanent record of CY 1997 activities at the Naval Command, Control and Ocean Surveillance Center, RDT&E Divsion (NRaD) and SSC San Diego. (NRaD became SSC San Diego on 1 October 1997. See discussion of reorganization in main text.) Although the history covers 1 calendar year, much of the information was only available on a fiscal year (FY) basis and is so noted in the text.

The history is divided into two main sections. The first section introduces SSC San Diego and describes developments in organization, personnel, and funding. The second section documents technical programs underway during 1997.

Because the results of scientific work often develop out of many years' effort, programs are not always documented annually. Previous command histories provide extensive background articles on many major programs. When possible, background articles are prepared for new or previously untreated programs. By consulting command histories written over a period of several years, a reader can follow the broad thrusts of Center research and development. In this year's history, background articles appear as featured programs in Calendar Year 1997 Highlights. These articles were originally printed in the SSC San Diego *Outlook* (JoAnne Newton, Editor) and have been revised for use in this history.

Appendices to this document provide supplementary Center information. Appendix A lists achievement awards given in CY 1997. Appendix B lists patents awarded in CY 1997. Appendices C and D provide lists of distinguished visitors hosted by SSC San Diego and major conferences and meetings at SSC San Diego, respectively.

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Introduction

Introduction to SSC San Diego

The Space and Naval Warfare Systems Center, San Diego (SSC San Diego) is a full-spectrum RDT&E laboratory and engineering center serving the Navy, Marine Corps, and other Department of Defense and national sponsors within its mission, leadership assignments, and prescribed functions. SSC San Diego reports directly to the Commander, Space and Naval Warfare Systems Command (SPAWAR).

SSC San Diego is at the cutting edge of the processes of transforming data into information, information into knowledge, and knowledge into understanding.

Our great strength at SSC San Diego is our involvement and expertise across the spectrum of C^4ISR. Our work ranges from basic research and prototype development through systems engineering and integration to life-cycle support of fielded systems.

People are critical to the successful achievement of our vision. The majority of our people are scientists and engineers, many of them with decades of experience in the Navy acquisition community. One of our most pressing current challenges is recruiting and developing the next generation of information technologists. Our organization continues to evolve to support our work across the spectrum of C^4ISR; cross-departmental teaming facilitates a responsive, flexible workforce.

SSC San Diego's facilities, laboratories, and fleet communications capabilities allow our engineers and scientists to replicate an operational environment unachievable in the commercial world. Only at SSC San Diego can the pieces of the overall C^4ISR system be integrated and tested in both laboratory and operational contexts. We are applying our unique expertise and capabilities to the central element of future naval warfare—information dominance.

SSC San Diego is uniquely positioned geographically to perform its mission. We are close to major operational commands of the air, surface, and submarine Navy; air, expeditionary and electronic components of the Marine Corps; the amphibious forces; and the Special Forces.

Our fleet support extends thousands of miles beyond San Diego Harbor and includes the SPAWAR Systems Activity in Hawaii that supports the Commander in Chief, U.S. Pacific Command, and Commander in Chief, U.S. Pacific Fleet, on-site, and the SPAWAR Systems Facilities in Guam and Japan that support the ships of the Seventh Fleet.

From a broader Joint perspective, we support multiple Army, Air Force, and Coast Guard programs. Additionally, we support other government agencies such as the Department of Justice in addressing their unique C^4ISR requirements.

Vision

To be the nation's pre-eminent provider of integrated C^4ISR solutions for warrior information dominance.

Mission

To be the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for command, control and communication systems and ocean surveillance and the integration of those systems which overarch multiplatforms.

Leadership and Technology Areas

Consistent with our mission, eight leadership areas are formally assigned to SSC San Diego. These leadership areas clearly represent SSC San Diego's C^4ISR charter as well as leadership areas outside that scope—ocean engineering and marine mammals. Beyond these, SSC San Diego has demonstrated national- and international-level expertise in a broad range of technology areas.

Assigned Leadership Areas

- Command, control, and communications systems
- Command, control, and communications systems countermeasures
- Ocean surveillance systems
- Command, control, and communication modeling and analysis
- Ocean engineering
- Navigation systems and techniques
- Marine mammals
- Integration of space communication and surveillance systems

Technology Areas

- Ocean and littoral surveillance
- Microelectronics
- Communications and networking
- Topside design/antennas
- Command systems
- Computer technology
- Navigation
- Intelligence/surveillance/reconnaissance sensors
- Atmospheric effects assessment

- Marine mammals
- Environmental quality technology/assessment
- Robotics and physical security

Organization and Personnel

Figures 1 and 2 show SSC San Diego organization and personnel.

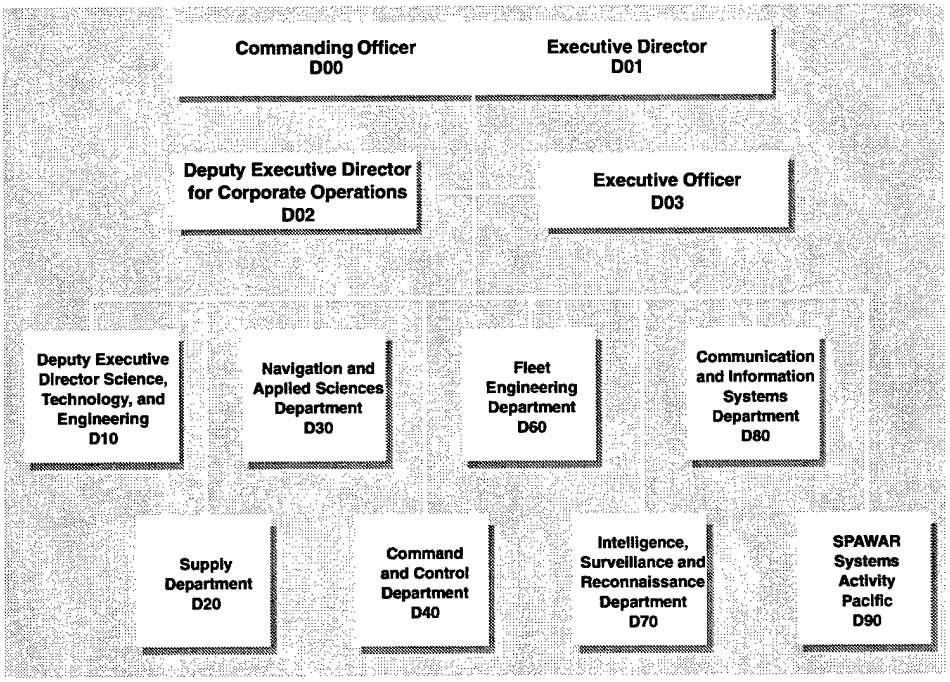

Figure 1. SSC San Diego Organization as of January 1998

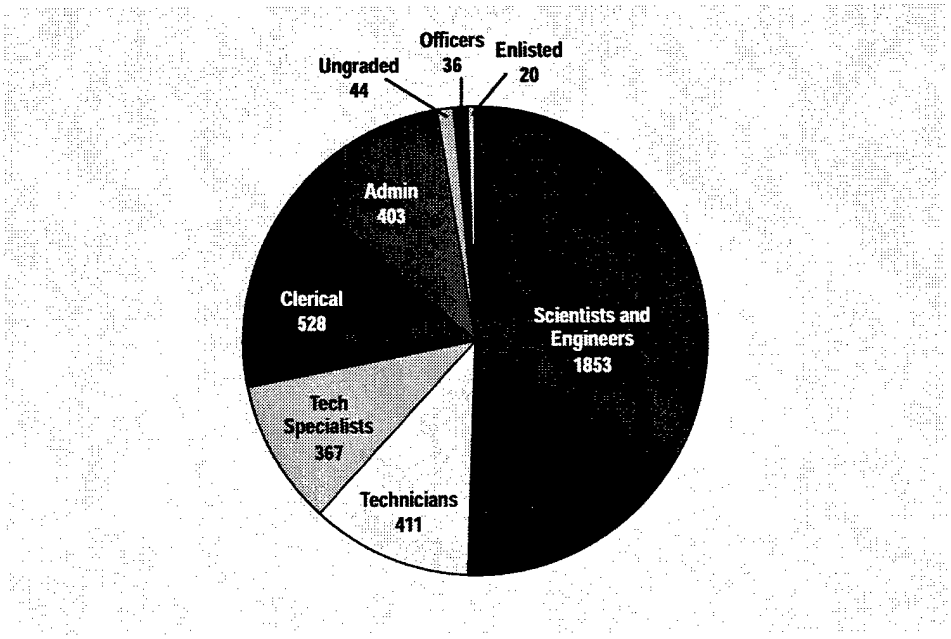

Figure 2. SSC San Diego personnel as of 1 October 1997 (Total 3662).

Funding

SSC San Diego receives funding from sponsors that include the Space and Naval Warfare Systems Command (SPAWAR), the Naval Sea Systems Command (NAVSEA), the Naval Air Systems Command (NAVAIR), the Office of Naval Research (ONR), U.S. Marine Corps (USMC), U.S. Air Force (USAF), and the Defense Advanced Research Projects Agency (DARPA). Actual funding numbers for FY 97 are given in the tables 1 through 3, with summaries for funding by sponsor and distribution of funds shown in figures 3 and 4.

Table 1. Funding by sponsor, FY 97.

	Reimbursables	Direct Cites	Total
SPAWAR	228,397,044	124,962,448	353,359,492
NAVAIR	38,404,458	35,179,577	73,584,036
NAVSEA	60,616,549	18,205,090	78,821,639
ONR	58,960,367	27,716,846	86,677,213
USMC	7,109,955	8,458,192	15,568,147
OTHER NAVY	102,648,396	33,168,115	135,816,512
USAF	32,066,006	19,535,274	51,601,280
DARPA	22,293,425	144,911,309	167,204,734
ALL OTHERS	67,216,267	43,113,987	110,330,255
TOTAL	617,712,470	455,250,841	1,072,963,312

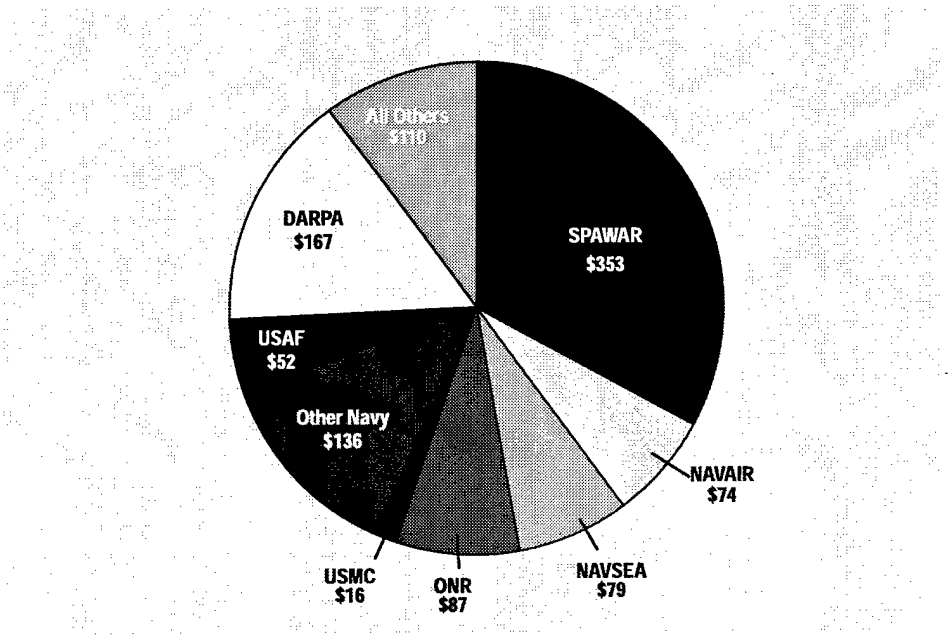

Figure 3. Funding by sponsor, FY 97 (in millions).

Table 2. Funding by appropriation, FY 97.

	Reimbursables	Direct Cites
RDT&E		
6.1	5,419,534	3,691,959
6.2	47,253,276	77,495,936
6.3	26,712,716	37,283,243
6.4	54,931,765	76,572,496
6.5	52,075,580	27,940,971
6.6	7,931,669	5,039,322
6.7	47,731,264	31,392,261
TOTAL RDTE	242,055,807	259,416,192
OPN	107,665,404	100,378,069
O&MN	136,859,952	29,186,927
Other	114,980,555	65,438,012
TOTAL FUNDING	617,712,470	455,250,841

OPN – Other Procurement, Navy
O&MN – Operations and Maintenance, Navy

Table 3. Distribution of funds, FY 97.

Direct Cites	455,250,841
Direct Contracts	200,796,295
Direct Labor	162,259,010
Direct Material, Travel, and Other	132,445,525
General Overhead	33,940,227
Indirect Overhead	61,461,863

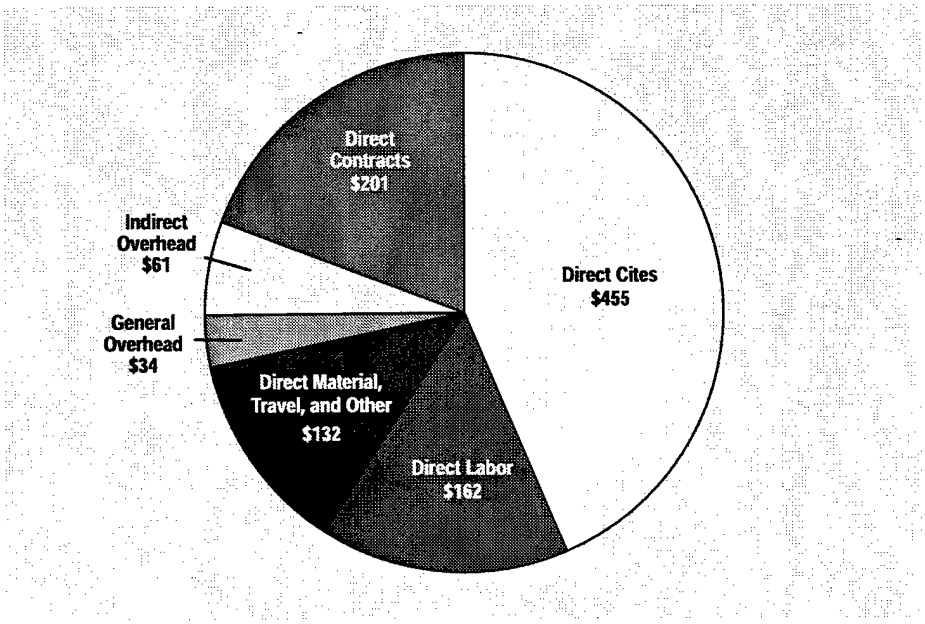

Figure 4. Distribution of Funds, FY 97 (in millions).

Administrative Developments

Major Organizational Changes

NRaD Renamed SSC San Diego

With the disestablishment 30 September 1997 of the Naval Command, Control and Ocean Surveillance Center (NCCOSC) and the official stand-up of Space and Naval Warfare Systems Command (SPAWAR) in San Diego, the NCCOSC RDT&E Division (NRaD) command title changed on 1 October 1997 to Space and Naval Warfare Systems Center, San Diego (SSC San Diego).

Background. In 1992, the Navy reorganized its research, development, and engineering infrastructure into four warfare centers, one of which was the Naval Command, Control and Ocean Surveillance Center (NCCOSC). Early efforts reorganized the 10 subordinate commands that initially formed NCCOSC into three divisions—the Research, Development, Test and Evaluation Division (NRaD), an engineering division on the West Coast in San Diego, and an engineering division on the East Coast in Charleston, South Carolina. Following further decisions under the Base Closure and Realignment Commission process of 1995 (BRAC '95), the Navy Management Systems Support Office (NAVMASSO) became another NCCOSC division, and the West Coast Engineering Division became part of NRaD.

Also as a result of BRAC '95 decisions, the Space and Naval Warfare Systems Command was transferred from the Washington, D.C., area to San Diego, and NCCOSC was directed to merge with SPAWAR—these changes became official 1 October 1997. The three NCCOSC divisions are now the SPAWAR Systems Centers San Diego (formerly NRaD), Charleston (formerly NISE East), and Chesapeake (formerly NAVMASSO).

Regional Centers. Under the new organization, a regional concept supports SPAWAR customers. The regional center commanders (CAPT Harold Williams for San Diego, CAPT Ronald Polkowsky for Charleston, and CAPT Nicholas Sullivan for Chesapeake) will serve as the focal point in that region for potential customers seeking assistance from any SPAWAR component. They will also provide administrative support as required to any of the other system center components located in their region. Line management responsibility for remote components will remain with the parent organization.

D70 Realignment

On 24 July 1997 (memo Ser D70/5–97 – 24 Jul 97) the Surveillance Department realigned to become the Intelligence, Surveillance, and Reconnaissance Department (D70). The purpose was to consolidate alignment with sponsoring organizations, combine complementary capabilities, and create a stronger intelligence, surveillance, and reconnaissance business focus. New functional statements for newly established or realigned codes were provided as follows:

D70, Intelligence, Surveillance, and Reconnaissance Department—Provide full-spectrum RDT&E and life-cycle support for intelligence, surveillance, and reconnaissance systems and technology.

D71, Maritime Surveillance Division—Deliver maritime surveillance sensor systems and technologies: fixed, towed, and deployable; signal and information processing; sensor modeling and prototyping; concept development and evaluation; and fleet introduction and operational testing.

D72, Signal Exploitation and Information Management Division—Deliver signal exploitation and information management, including systems and technologies: cryptologic systems, ISR information management and integration, collaborative ASW, over-the-horizon radar, and information warfare exploitation systems.

D73, Joint & National Systems—Provide information superiority for joint and coalition warfighters: RF systems development, surveillance radar technology, information warfare, tactical and intelligence systems development, and data dissemination.

D74, Ocean Systems Division—Provide ocean and littoral surveillance and reconnaissance systems and technologies, including: sensors, imaging, and visualization; ocean search, work, and recovery systems; rapid prototyping; undersea communications; manned and unmanned systems, and maritime test and evaluation.

Administrative Highlights

Customer Satisfaction

The SSC San Diego Quality Council chartered a survey to determine how our sponsors and fleet customers rate the Center's products and services. The overwhelming majority of the comments praised the capabilities, performance, and attitude of SSC San Diego employees.

National Defense Industrial Association (NDIA) Partnership

The National Defense Industrial Association (NDIA) was formed to foster better communications between contractors and government. SSC San Diego has formed a team with NDIA representatives to look at how the government and industry can work effectively together within the legal boundaries we have. SSC San Diego continued this effort with success reflected in a stream of products, better communications, and continuous education and process improvements.

Cooperative Research and Development Agreements (CRADA)

SSC San Diego continued to support the transfer of federally developed technologies to U.S. industry through building strong relationships with individual partners. The Cooperative Research and Development Agreement (CRADA) is an agreement between SSC San Diego and one or more nonfederal parties under which SSC San Diego provides personnel, facilities, equipment, or other

resources. CRADAs are dual-use opportunities used to (1) support sponsor requirements to provide commercial off-the-shelf (COTS) products, and (2) improve the economy by the company producing the product for civilian uses. SSC San Diego has about 15 active CRADAs at any one time and 5 to 10 in negotiation at any one time.

Defense Travel System (DTS) Demo Project

SSC San Diego continued the Defense Travel System (DTS) Demo Project, a local implementation of the DoD Travel Re-engineering Concepts of Operations, which focuses on mission requirements and views the traveler and approving officials as honest and responsible decision-makers within their own organizations. The project has been an overwhelming success mainly because orders are processed in a day, modifications are no longer required, and travelers are paid through Electronic Funds Transfer 5 days after the voucher is approved by the Approving Official.

SSC San Diego Initiatives

SSC San Diego, in focusing on the areas that account for the largest amount of money coming into the lab, has created tiger teams to evaluate these processes and streamline them to the maximum extent. The areas of focus were: (1) delivery orders, (2) oral presentations, and (3) Broad Agency Announcement (BAA) streamlining. The execution of delivery orders accounts for approximately 70 percent of all dollars supporting the mission. The team produced results that reduced the time frame for placement of these orders by 89 percent.

1. Delivery Orders. As delivery orders accounted for 70 percent of all our business, the Indefinite Delivery Order Type Contract is the vehicle used for issuance of these delivery orders. Historically, SSC San Diego has issued this type of contract in 12 to 16 months. The team, by substituting oral presentations for technical approach and corporate history, reduced the time frame for awarding this type of contract to 4 to 7 months.

The Beyond Expedited Delivery/Task Order Procedure (BEDOP) is a significant improvement in the Delivery/Task Order process. It is a concept devised here at SSC San Diego that has resulted in an *89-percent* decrease in the Procurement Administrative Lead Time (PALT) for Delivery/Task Orders. Since SSC San Diego issues nearly 3000 delivery orders per year, this single initiative has produced remarkable savings in time and effort for Ordering Officers. BEDOP has now been adopted by a number of other Navy activities, and SSC San Diego has been formally recognized by ASN (RD&A) for this initiative.

2. Oral Presentations. SSC San Diego has successfully implemented and uses oral presentations for technical/management portions of proposals. Presentations are conducted in person, using a formal briefing format. This method has been used very successfully for both research and development and engineering service requirements, and ASN (RD&A) has recognized SSC San Diego for this initiative.

3. BAA Streamlining. SSC San Diego is one of a select few activities delegated authority to use this contracting method. It has been used extensively and has

been very successful. SSC San Diego's successful implementation of streamlined Broad Agency Announcements (BAAs), and the many contracts, grants and cooperative agreements resulting from them has been formally recognized by ASN (RD&A).

Reinvention Laboratory Initiatives

SSC San Diego implemented four initiatives in FY 1997:

1. Waiver of advance approval of solicitations for services based on the number of hours.
2. Waiver of the prohibition against using "brand name or equal" purchase description for requirements exceeding the simplified acquisition threshold.
3. Waiver of requirement for written explanation when not using sealed bid procedures.
4. Waiver of requirement for written contracting officer determination to restrict competition for simplified acquisition procedures exceeding the micro-purchase level.

RFP/RFQ Online

Included in our Web Page, entitled Online Procurement Information System (OPIS), is a link where contractors can access RFPs and RFQs electronically. This has resulted in significant savings in paper, postage, and clerical labor. This site also offers the SSC San Diego requirements list that is currently advertised in the Commerce Business Daily, draft statements of work and, if necessary, a form to request hard copies of RFPs.

Commercial Items

SSC San Diego makes extensive use of expedited procedures for commercial items, using the combined RFP and synopsis option and shortened RFP response times. In addition, SSC San Diego is a leader in the movement toward the use of commercial item descriptions and performance work statements. A dedicated effort continues to streamline COTS and NDI (CaNDI) procurements using a combination of customer education, communication of news and policy via the Internet, and Integrated Process Team (IPT) meetings. We have been concentrating not only on CaNDI acquisition, but on logistics support issues, such as provisioning and warranties.

"Other Transaction" Authority

SSC San Diego has received authority to award "Other Transactions" pursuant to 10 U.S.C. 2371. We have successfully used this new authority to support basic, applied, and advanced research, including Technology Reinvestment Programs, to stimulate the application of dual-use technologies.

BPAs Under Federal Supply Schedule

SSC San Diego has established a number of BPAs under Federal Supply Schedules. These agreements avoid duplicating the time and effort previously

expended by GSA in awarding basic contracts and take advantage of the speed and ease with which orders can be placed under BPAs. SSC San Diego is making extensive use of the Internet to award the BPAs and to expedite the placement of orders under these agreements.

Technical Program Accomplishments

Calendar Year 1997 Technical Highlights

The programs featured in this section were documented in the NRaD/SSC San Diego *Outlook* (JoAnne Newton, Editor, Code D003, Space and Naval Warfare Systems Center, San Diego, CA 92152-5185.) Additional technical accomplishments are grouped by major work areas following the articles in this section.

Chronology of Highlights

- February 1997 – AN/SLQ-20B Achieves Milestone III Production Decision
- February 1997 – TACINTEL II+ Completes Successful OPEVAL
- February-March 1997 – Hunter Warrior AWE: "Forward from the Sea"
- March 1997 – ACDS Staging Facility Introduced
- March 1997 – Joint Acceptance Test Completed for CTAPS 5.2
- March 1997 – Medical Component of Tandem Thrust '97
- March 1997 –NRaD Helps Move NCTAMS Equipment and Provide Communications Support
- April 1997 – Iceshelf-97 Places Acoustic Array Beneath Arctic Ice Pack
- May 1997 – New Radio Propagation Assessment System Developed
- June 1997 – Ribbon Cutting Held for New GPS Central Engineering Activity
- June 1997 – NRaD Signs CRADA with SUN Microsystems to Develop/ Test JAVA
- July 1997 – NRaD Demonstrates "Unity of Purpose" in JWID 97
- August 1997 – Code D653 Solves Long-term Problem
- August 1997 – MAST Enters Final Phase of Integration, Testing, and Training
- August 1997 – MDARS Receives Another Patent
- September 1997 – PMRF Communication Systems Upgraded by Code D335
- September 1997 – System Upgrade Offers New Security at Townsend Range
- October 1997 – Sensate Liner Technology May Save Lives
- October 1997 – GPS Team Completes Evaluation
- October 1997 – CARIBROC Upgrade Facility Opens in Key West, Florida

AN/SLQ-20B

AN/SLQ-20B Achieves Milestone III Production Decision (NRaD Outlook, vol. 20, no. 18, 19 Sep 1997)

On 27 February 1997, a Navy program decision meeting (NPDM) was held at the Naval Air Systems Command (NAVAIR) in Washington, D.C., during which Rear Adm. Glenn Phillips, Deputy Commander for Acquisition and Operations, approved Milestone III for the AN/SLQ-20B program. This milestone decision permitted the AN/SLQ-20B program to proceed into production of units for operational use by fleet combatants, starting with the DDG-51 Class AEGIS (Airborne Early Warning/Ground Integration Segment) destroyers. An integrated logistics assessment (ILA) was conducted to assess the adequacy of planning, management, and execution of the AN/SLQ-20B program, and as part of the approval process for Milestone III, an integrated product team (IPT) was assembled to define and develop the programmatic and life-cycle support documentation required by the new Acquisition Reform Initiative.

On 10 June, NRaD [SSC San Diego] awarded a $7.76 million AN/SLQ-20B initial production contract to GEC Marconi Hazeltine Corporation of Long Island, New York. The contract will deliver seven systems for the AEGIS DDG-51 class and one system for the CVN-68. In addition to the eight systems, a computer-based course for onboard training will be procured as a replacement to the standard Navy schoolhouse training for maintenance personnel. The antenna segment of the AN/SLQ-20B System will be procured by the Naval Sea Systems Command with award of the antenna production contract to AIL, Inc. on June 11. The production contract award followed an engineering and manufacturing development (E&MD) phase started in FY 93. Technical evaluation (TECHEVAL DT-II) was completed in September 1996 and operational evaluation (OPEVAL OT-II) was completed in November 1996. Program sponsors of the AN/SLQ-20B Program through Milestone III were Dr. Robert Walinchus, Program Manager for Air Traffic Control and Landing Systems (PMA 213), and Cmdr. Joe Horn, Resource Sponsor for Theatre Air Warfare Division of the Surface Warfare Department in the Office of the Chief of Naval Operations (CNO N865).

Procurement of the AN/SLQ-20B production units will be handled by NRaD [SSC San Diego] under program direction/funding from NAVAIR PMA 213. Code D45, Integration and Interoperability Division, will be the technical procurement agent for the AN/SLQ-20B, and Code D334, Low Approach Landing and Navigation Systems Branch, will be the in-service engineering activity (ISEA) responsible for the installation and integration of AN/SLQ-20B systems aboard ship.

Key Center individuals contributing to the development of the Milestone III decision and approval process and production contract procurement were Stan Miyashiro, Joint Strike Command, Control, Communications, Computers, and Intelligence and Identification Systems (Code D4515); John Quintana and Paul Iordanides, Technology Development and Insertion (Code D4525); Ken Avedisian, Office of the Deputy for In-Service Engineering (Code D305L); Tom Rudy, Low Approach Landing and Navigation Systems Branch (Code D334);

Melissa Cleland and Sharon Pritchard, Contracts Division, Command and Control/ Corporate/Construction Architectural and Engineering Branch (Code D211), and Michele Marshall, Contracts Division (Code D21T). Science Application International Corporation engineers Frank Morris, Gregory Dahlvig, Al Roome, and Rick Luke participated and contributed to the development and testing of the AN/SLQ-20B. USS *John Paul Jones* (DDG 53) (TECHEVAL/OPEVAL test ship); Naval Air Warfare Center Aircraft Division, Patuxent River; and the Naval Surface Warfare Center, Virginia Beach also made major contributions to the installation and testing of the AN/SLQ-20B System.

TACINTEL II+

TACINTEL II+ Completes Successful OPEVAL (NRaD Outlook, vol. 20, no. 16, 8 Aug 1997)

TACINTEL (Tactical Intelligence) II+ program successes continued with receipt of the OT (operational test)-IIA test report from Commander Operational Test and Evaluation Force (COMOPTEVFOR). TACINTEL II+ (Build 1) was determined to be both operationally effective and suitable. COMOPTEVFOR recommended fleet introduction to the Chief of Naval Operations.

The TACINTEL II+ program was developed to satisfy operational requirements document 439-06-96. This system provides a simplified, easily upgraded, technologically advanced, secure, and highly flexible special intelligence communications system for supporting Navy operations. The TACINTEL II+ program mandates the use of state-of-the-art equipment following the Department of Defense and Navy concept of open system architecture design. It takes advantage of available commercial and military technology.

The program consists of four hardware/software phases. In Phase 0, existing TACINTEL Link Control Facility (TLCF) equipment was replaced with a DTC (desk top computer)-2 and versa module eurocard chassis (VMEC) hosting existing software functionalities. Shipboard TACINTEL systems will be upgraded from the UYK-20 to a TAC (Tactical Advanced Computer)-3 and a VMEC during Phase 1. Because there will be no change in functionality associated with this upgrade, Assistant Secretary of the Navy for Research, Development, and Acquisition agreed in 1992 that the upgrade constituted a preplanned product improvement. Operational testing was not required before installation could begin.

In FY 93, work began to port this software to the TAC-3. The TACINTEL Software which is operating on the TAC-3 was completed in FY 95 and was demonstrated on the USS *Coronado* (AGF 11). In addition, as part of Phase 1, an interim special intelligence voice capability was demonstrated aboard an EP-3E aircraft. This provided a communications capability between the EP-3C, Air Force RC-135 aircraft, and selected ground stations on ultrahigh-frequency satellite communications. Phase 2 consisted of two software development builds and the installation of both the software and hardware to provide TACINTEL II (Phase 2, Build 1) and INTELligence Contingency Satellite NETwork (INTELNET) (Phase 2, Build 2).

Build 1 provides additional capabilities including a new dynamic Media Access Control layer protocol and compression for variable length messages, Ethernet connectivity into the Automated Digital Network System (ADNS), and new graphical user interface. TACINTEL II+ consists of a TAC-3 computer workstation, VMEC, uninterruptable power supply, and a Documax high-speed printer. Phase 3 will complete the transition of TACINTEL II+ to a multimedia environment via the Joint Maritime Communications Strategy/ADNS.

During 1996 and 1997, TACINTEL II+ Phase 2, Build 1 successfully completed developmental testing (DT-IIA1 and DT-IIA2) and operational evaluation (OPEVAL). Dr. Albert Legaspi, Network Technology Branch (D827), headed both phases of developmental testing as test director providing technical and managerial support.

DT-IIA1 was a laboratory-based test conducted at the Joint Integrated Communication Facility June through November 1996. A test plan was generated to outline the critical operational issues of the program, test requirements, and personnel support.

David Hayashi, head of the Tactical Network Communications Branch (D631), provided laboratory support and engineers to assist both phases of the test. Four TACINTEL II+ systems were provided for testing three operating training systems. In addition to developmental testing, training was provided to operators of the candidate ships selected for the technical evaluation (TECHEVAL). Upon successful completion of DT-IIA1, the test moved to Norfolk, Virginia, for DT-IIA2 TECHEVAL. TECHEVAL was conducted onboard the USS *Kearsarge* (LHD 3), USS *John C. Stennis* (CVN 74), USS *Normandy* (CG 60), and at the TACINTEL Link Control Facility in Virginia.

Cryptologic Technician Operations Chief (Surface Warfare) (CTOC (SW)) Scott Yeager monitored both phases of developmental test.

Cmdr. Rollie Whalen, COMOPTEVFOR, is operational test and evaluation liaison officer for command, control, communications, computers, and intelligence systems. He said, "Engineering done right the first time is a credit to Dr. Legaspi and his research and development (R&D) team. OPTEVFOR test director CTOC(SW) Yeager provided early and continuous involvement in the development process. The program management R&D and operational testing stake holders formed a partnership in setting up this program for success, not only in operational evaluation (OPEVAL), but in rapidly developing and fielding state-of-the-art systems that help our shipmates do their jobs more effectively."

Whalen commented further: "The significant enhancements in message handling, dynamic resource allocation, and easy-to-use graphical interface will certainly result in more accurate and timely tactical intelligence and ultimately better warfighting decisions. This OPEVAL is particularly noteworthy in that it was the first and only formal operational test conducted on the TACINTEL II+ system and no major deficiencies were identified during the test."

OT-IIA OPEVAL was conducted 18-27 February. The comprehensive, fleet-oriented test took place aboard the USS *Kearsarge* (LHD 3), USS *Peterson* (DD 969) and Naval Security Group Activity, Northwest. Stringent communications

demands were closely monitored while the new TACINTEL II+ system used joint and naval operational communication paths including live fleet satellite communications networks.

Dr. Legaspi attributes the program success to the collaborative efforts of a variety of organizations including TACINTEL II+ program manager CAPT (now RADM) Ken Slaght, TACINTEL II+ project engineer Allan Oyama, and Jack Leonard of Advanced Communication Systems, Inc. They provided support that continued throughout the developmental testing/operational testing process.

TACINTEL II+ program team members of particular note were Allen Heaberlin and Phuong Nguyen of Network Technology Branch (D827); Bruce Kemp of Information Systems and Network Application Branch (D821); David Hayashi, David Guitas, George Frederick, Jeffrey Jung and Christopher Lai of the Tactical Network Communications Branch (D631); Jack Leonard, Robert Hall, Rick Koch, John Pontisso, Carl Sharp, Richard Caruso, Roger Carraway, Dan Rockwell, Jim Helms, and Jim Yokomizo, of Advanced Communication Systems; Edward Gruner, William Bentley and Les Hockman of Science Applications International Corporation.

"I would also like to add a special thanks to Margaret Robbie of Code D842, Satellite Communications Resources Branch, for providing insight to COMOPTEVFOR's test methodologies," Dr. Legaspi said.

Hunter Warrior Advanced Warfighting Experiment (AWE)

Hunter Warrior AWE: "Forward from the Sea" (NRaD Outlook, vol. 20, no. 7, 4 Apr 1997)

NRaD [SSC San Diego] supported the Marine Corps Hunter Warrior Advanced Warfighting Experiment (AWE) (conducted between 27 February and 15 March 1997). Hunter Warrior was an experiment to determine if new concepts and advances in technology allow a sea-based Marine Air Ground Task Force (MAGTF) the additive capability to conduct dispersed operations on an extended noncontiguous battlefield.

"The NRaD Hunter Warrior team, made up of various codes within NRaD, had a challenging and exciting experience," said Susie Hartzog, Advanced Behavioral Representation, Code D44205.

Hartzog is head of the Systems Engineering and Integration (SEI) team. The SEI team included Lt. Cmdr. John Owen, LT J.G. Satish Skariah, and systems engineers and analysts from Advanced Telecommunications Incorporated, Science Applications International Corporation, KOAM Engineering Services, and Galaxy.

"Without proper coordination, testing, and management of the technical exercises the intent of Hunter Warrior, to study potentially new doctrine, would be lost or subsumed by technical difficulties. The SEI team concentrated on solving the technical issues surrounding integration of the Hunter Warrior AWE. The

SEI team focused on operational objectives that were the driving force behind the experiment," she said. On 1 October 1995, the Marine Corps Commandant's Warfighting Laboratory (CWL) was established to lead the advanced operational concept development in the Marine Corps. The commandant directed the CWL to establish a Special-Purpose Marine Air Ground Task Force (eXperimental), referred to as SPMAGTF(X), to assist in evaluating advanced operational concepts and supporting technologies. The CWL outlined a 5-year plan to provide a long-term multi-phased experiment to evaluate advanced warfare concepts and technologies. Each phase builds upon the lessons learned from the previous one.

Hunter Warrior, the initial AWE of this 5-year plan, was conducted between 27 February and 15 March. Urban Warrior, the second experiment scheduled for mid-1998, will feature operations in urban and close terrain. Capable Warrior, the third and final experiment to be conducted in 2000, will be a Naval Expeditionary Force operation. Each of these experiments combines live and simulated forces.

Hunter Warrior objectives were coordinated among the CWL, SPMAGTF(X), Marine Corps Systems Command, and the Marine Corps Air Ground Combat Center (MCAGCC). The three experimental objective areas of Hunter Warrior were (1) dispersed, noncontiguous battlespace operations; (2) command, control, communications, computers and intelligence/single battle; and (3) enhanced fires and targeting.

Hunter Warrior was intended to prove the hypotheses of Marine Corps small unit operations: flattened command and control architecture; technical enhancements to command and control systems; and maintenance of a majority of decision processes afloat to reduce the number and physical signature of command and control nodes ashore.

Despite substantial progress in each technology area, technical support for Hunter Warrior required an overall systems engineering approach to be successfully executed. Over five sites and more than 20 computer-based systems participated in this experiment.

Five primary sites participated in the Hunter Warrior experiment: MCAGCC, Twentynine Palms; Marine Corps Tactical Systems Support Activity (MCTSSA), Camp Pendleton; Marine Corps Base, Camp Pendleton; NRaD; and the USS *Coronado* (AGF 11), Flagship of Commander, Third Fleet underway in the Southern California operating areas. The MCAGCC, Twentynine Palms, was the site for the Consolidated Maintenance Facility (CMF). Located at the LeatherNet facility, it provided the primary communications link between the Marines in the field at Twentynine Palms and the Enhanced Combat Operations Center (ECOC) located at MCTSSA. Demonstrated at MCAGCC were personal digital assistants from Apple Computers called "Newtons." These were hand-held by individual Marines and observer controllers linked to headquarters. Ericsson Land Mobile Radios, including Global Positioning System equipment known as the Newton–Ericsson Leathernet System, was demonstrated. "Leathernet" is used to continuously track friendly unit locations; identify and target enemy positions; call in indirect fire support (naval gunfire, artillery, close air support, etc.); or direct fire and force-on-force engagements using instru-

mented individual Marines. Simulation of the effects of indirect fire and aviation delivered direct fire munitions on targets were implemented. Damage assessments and 3-D visualizations were performed using LeatherNet, FastFleet, and Command Vu software at the LeatherNet facility.

MCTSSA, Camp Pendleton, is the host facility for the ECOC. The ECOC, conceptually afloat but physically located at MCTSSA, is being developed to better manage tactical battlefield information and serve as a unified engagement coordination center. The Marine Corps Base, Camp Pendleton, was the site for the secondary CMF, providing communication links between the ECOC at MCTSSA and the Marines in the field at Camp Pendleton. The Combat Service Support (CSS) Enterprise at Camp Pendleton supported the Marines in the field at Twentynine Palms. The air combat element provided air operations functions including mission nominations, mission detailed development, and development of air plans to support the Marines in the field at Twentynine Palms and the First Marine Expeditionary Force. NRaD was a gateway to remote sites providing servers for Joint Maritime Command Information System (JMCIS) Joint Operational Tactical System, Shared Net (an information store and router), and the Experimental Battlespace Agents and Instrumentation Toolkit (xBAIT). USS *Coronado* operated as a Hunter Warrior situation awareness node for the Commander, Third Fleet Staff onboard. Connectivity with the ECOC was provided through nonclassified Internet protocol router network (NIPRNET) services from NRaD.

Chuck Mirabile, Deputy for Advanced Technology, D405, was the project manager in support of the CSS Enterprise. The CSS Enterprise is an element in the SPMAGTF(X) and was responsible for combat service support (CSS) during the advanced warfighting experiment. Assisting Mirabile were Russ Graff, Engineering, D4121; Tue Nguyen, Technology Development and Insertion, D4525; Jane Hofmockel, Integrated Undersea Surveillance Branch, D722; Brian Tran, Software Development, D4323; and contractor support from Science Applications International Corporation.

The CSS Enterprise focused on total CSS asset visibility keyed to situational awareness, timely and effective CSS, and minimizing the forward footprint. NRaD's involvement in the CSS Enterprise was mainly to develop a rudimentary CSS command and control system (CSS–C^2S) based on open-system design, industry standards, web technology, distributed databases, and client/server architecture. The goal was to provide watch personnel with information displays to manage the CSS situation in near real-time instead of reacting to data displays after the fact.

An additional work area assisted the Marine Corps in improving the Rapid Request Tracking System (RRTS). Various interfaces were established between the CSS–C2S and RRTS package with national-level logistics and reference databases; a Qualcomm vehicle tracking system; and the Global Command and Control System. The Common Data Repository (COMDAR), a CSS command and control server running under Windows NT, was the center of activity. Ron Crepeau and Patty Diercks, Technology Insertion and Information Warfare, D4223, led the team that provided the xBAIT. xBAIT was used to develop plans and monitor and visualize the operational battlespace in order to aid in decision making.

Applied Technology Branch, D745, headed by David Carlton, developed, deployed, demonstrated, and tested a prototype Hybrid Mobile Power Center at the Combat Service Support Operations Center located at MCAGCC. The "hybrid" system employs both photovoltaic and wind power technologies to charge a conventional lead acid battery. The system currently features an onboard data acquisition system that can be remotely accessed via cellular telephone for daily monitoring during the test period. The message processing center allows for better use of training resources by eliminating the need for fuel and by reducing the environmental fees normally paid for operation of diesel generators. Assisting Carlton were Abby Westerman and Richard Carey, both from D745. The results of this demonstration should serve to influence future design concepts. Liz Holland, Command, Control, Communications, Computers, and Intelligence Systems Engineering and Integration, D4222, and her team provided JMCIS operational training to the SPMAGTF(X). A focus of the training was to perform track database management within the ECOC. Don Gingras, Propagation Division, Technical Staff, D8805, assisted Hunter Warrior by providing radio frequency load analysis studies.

ACDS Staging Facility

ACDS Staging Facility Introduced (NRaD Outlook, vol. 20, no. 6, 21 Mar 1997)

The ACDS Staging Facility is a joint PEO TAD (Program Executive Office Theater Air Defense)/NRaD [SSC San Diego] project. It was developed as a reconfigurable system integration and grooming site. The facility was developed by the management team of Dick Kolb and Dave Lutz, Software Engineering, Code D4321; and Lt. Cmdr. F. Roy Beadle Jr., Systems Engineering, D4303. The Staging Facility provides the Advanced Combat Direction System (ACDS) engineering and installation teams an environment to work together and develop a mature system for installation onboard warfighting ships. The staging and integration process allows for the actual ship's system components to be installed and integrated into a working system prior to transfer to the shipyard for installation.

First the facility is configured as a mock-up of the ship's spaces. Then the equipment involved in the modification or upgrade is installed as it would be on the ship. This process allows for problem solving to correct installation plan errors prior to equipment delivery to the ship. In turn, these solutions decrease the time a ship is taken off-line for system upgrades.

The ACDS Staging Facility incorporates Shipboard Modular Arrangement Reconfiguration Technology (SMART) with a track system, similar to that used in aviation, to secure cargo to an aircraft deck. This reduces the time to do equipment installation by eliminating all the welding and cutting normally required.

When amphibious assault ship (general-purpose) (LHA) ACDS upgrade hardware is installed and system integration and testing is underway for the first time, problems in the installation plan may be discovered that could cause weeks of delay aboard ship.

"The Staging Facility is only part of the story," said LT Cmdr. Beadle. "The technology that is being incorporated to make up the LHA ACDS system is in the forefront of today's technology. The Digital Radar Video Data Distribution System (DRVDD), Tactical Display Consoles (TDC), Peripheral Support Group (PSG), and Fiber Optic Distributed Data Interface Local Area Network (FDDI LAN) are all on the cutting edge and make up some of the major components of the LHA ACDS system," he said.

Digital Radar Video Data Distribution (DRVDD) System for LHA

One important aspect of a combat system is the presentation of radar and identification friend or foe (IFF) sensor data.

"The distribution and display of this data for the LHA incorporates unique advances that have roots in the innovative work headed by Duane Gomez," said Doug Lasniewski, Display Evaluation (D44214). Duane Gomez is now deputy for business of the Simulation and Human Systems Technology Division (D441). He prototyped the Light-Weight Modular Display System (LMDS) about 15 years ago.

"Through Duane's continuing efforts, the first Digital Radar Video Data Distribution System (DRVDDS) has been developed," Lasniewski said. The DRVDDS processes radar video into messages, interfaces with the central identification friend or foe (CIFF), distributes the data over the FDDI LAN system, and displays it on the tactical display consoles (TDC) using a radar Scan Converter (RSC). This implementation precludes the need for expensive radar switchboard equipment and analog IFF decoders as all consoles have independent access to sensor data, from all sources, at all times as the data is broadcast on the local area networks (LAN). For LHA, these sensor inputs include seven radars with multiple videos, one recorded radar, two simulators, and three IFF systems. At the console the RSC can mosaic and display up to three independent asynchronous radar videos simultaneously. The IFF display is in the form of graphic symbology.

The radar processing, control, and interfacing to LANs and CIFF is accomplished by Versa Module EuroCard (VME) circuit cards collocated in the radar signal users and distribution signal converter CV-3989. With the incorporation of DRVDD modifications, it becomes an analog-to-digital converter/converter cabinet that already has connectivity to all radar sources. This joint use of the cabinet reduces cost for installation and ongoing logistic support. This part of the DRVDD is called the radar broadcast equipment (RBE) and consists of commercial off-the-shelf central processing unit and FDDI LAN boards. The FDDI LAN has specialized express transfer protocol (XTP) firmware and driver and specialized radar processing boards.

Crucial to the success of this program was the analysis, design, development, implementation, and testing of the four FDDI LANs. These networks consist of dual-attached, dual-homed, VME-based, fiber-distributed data interface network boards running XTP, transmission control protocol (TCP) over the Internet protocol (IP). To sustain the high data rates for the digitized radar and map server, it was necessary to interface four fiber optic networks to each console. The network team was led by Charles Suggs, Engineering, D4121. Technical

team members were Harry Gold, Mark Zabriskie, Merle Neer, Jim Morrow, and Bob Laughlin. The card cage supporting the tactical data computer includes the corresponding FDDI LAN boards, a RSC, and a VME-to-VME bus bridge. The bridge connects the TDC's master VME backplane with a secondary slave VME backplane that supports radar data being transferred from the FDDI boards to the RSC. This approach assures the radar system does not affect other console VME bus access activities.

The project was initiated by obtaining a contract to produce the radar and RSC and VME boards. This work was done by NRaD retiree Frank Martin. Doug Lasniewski continued Martin's work providing the lead on the project. Dwight Wilcox wrote RBE control software. Robert Luna supports hardware and software testing. He aided in resolution of various system problems. Rick Worthen chose the VME bridge used for the TDC and resolved several bus issues with the bridge manufacturer regarding its use with the FDDI and RSC.

The Multiple Radar Simulators System (MRSS) was constructed to perform a complete radar/LAN loading system test in the staging facility. The MRSS can simulate all of the radar video inputs that will be encountered on the LHA. A special personal computer-hosted board was designed by Weldon Dahlke to accomplish this. David Schmiedeberg programmed the board's logic arrays and Dwight Wilcox and Peter Pham wrote the radar program that controls the board.

The LHA Peripheral Support Group (PSG)

The Peripheral Support Group (PSG), AN/SYQ-24 (V)1, is a critical item of the LHA ACDS and replaces five pieces of Navy legacy electromechanical peripheral equipment with small, relatively lightweight, reliable, logistically supportable microprocessor-based general-purpose hardware. The PSG uses the AN/UYQ-70 hardware and software elements and incorporates the UNIX-based real-time operating system and commercial standard VME architecture. The replaced equipment includes the RD-358 magnetic tape unit, the AN/UYH-3 magnetic disk drive, the AN/USQ-69 data terminal, the TT-624 teleprinter, and the Link-14 adapter of the AN/UGC-13. In addition to the replaced equipment, the PSG provides a new capability to perform operations on the ACDS AN/UYK-43 computer and sets forth a remote location through the Auxiliary Display Control Unit (ADCU). The PSG is controlled and operated from a Navy standard Hewlett-Packard 770, Tactical Advanced Computer-4 (TAC-4) workstation PCS.

The PSG development team membership includes both government and contractor personnel from INTERLOG and Hughes Technical Services Company. Bill Thorpe is program manager. James Culligan is senior systems programmer, responsible for the design and development of the AN/USQ-69 data terminal set emulation. Culligan also established the PSG development and production library systems. Burton Carlson, programmer/analyst, designed and developed the ADCU. John McCormick is programmer/analyst responsible for the system casualty backup capability and touch panel display. Dr. George Chen is senior systems analyst responsible for the design and development of the RD-358 maximum transmission unit emulation, the tape device emulated in the PSG. Robert

D. Smith was hardware system analyst providing the team with hardware fabrication and software delivery and installation. Charles Dickerhoff, system programmer, provided the team with laboratory expertise and ACDS operations specialist capability.

ACDS Command Table

The ACDS Command Table is developed, fabricated, and installed by software and hardware engineers of the Display Engineering Project Team headed up by Robert D. Smith, under the group leadership of Chuck Ledwin of the Systems Integration Group.

The Command Table was developed to provide support for the overall mission of the Navy in command, control, communications, and computers (C^4) environments. In addition to meeting the current C^4 needs of the Navy, the Command Table uses state-of-the-art commercial off-the-shelf software and hardware technology that provides C^4 growth capability. In addition to the LHA installation, the Command Table is also installed at the NRaD Lab 360 and aboard the USS *Dwight D. Eisenhower* (CVN 69), USS *Constellation* (CV 64), USS *Nimitz* (CVN 68), USS *John F. Kennedy* (CV 67), and the USS *Wasp* (LHD 1).

Robert D. Smith is project head and hardware system analyst providing the team with hardware fabrication, software delivery, and installation. Charles Dickerhoff, Mike Taylor, Khoi Nguyen and Richard Breen are the system programmers who provide the team with laboratory expertise and ACDS operations specialist capability.

CTAPS 5.2 Joint Acceptance Test

Joint Acceptance Test Completed for CTAPS 5.2 (NRaD Outlook, vol. 20, no. 8, 18 Apr 1997)

Between 3 and 14 March, Roy McConnaughey, Command, Control, Communications, and Intelligence (C^4I) Product and Customer Support, Code D4222, coordinated a joint acceptance test (JAT) for the Contingency Theater Automated Planning System (CTAPS) 5.2 with the Air Force's 605 Test Squadron. The 605 Test Squadron was collocated at Davis–Monthan Air Force Base, Arizona. CTAPS Version 5.1.3 is fielded worldwide to all services. The proposed upgrade to CTAPS 5.2 is a major stepping stone for the Navy as it is the first version to run on a Navy Tactical Advanced Computer (TAC) Hewlett-Packard platform.

"CTAPS was designed by the Air Force as an elaborate theater-level mission planning and execution system. It comprises applications and databases used to keep track of air assets and targets within a given region," McConnaughey said.

After the Persian Gulf War, several legacy systems, including the Advanced Planning System (APS), Computer Aided Force Management System (CAFMS), Rapid Application of Air Power (RAAP), and Air Deconfliction System (ADS) were combined to form CTAPS. The Joint Chiefs of Staff (JCS) designated it the joint system responsible for producing and disseminating air task-

ing orders (ATO), which are United States military text format (USMTF) messages.

CTAPS supports the Joint Force Air Component Commander's (JFACC) role by accepting the candidate target list (CTL) and the command directive from the Commander Joint Task Force (CJTF). It then uses an intelligence database to acquire the enemy order of battle used in the weaponeering of targets. A target nomination list is generated and imported into the planning cycle using APS and CAFMS. Air space is then defined using ADS and deconflicted against the planned missions. All air missions are then collated into a single ATO. The ATO is then disseminated from the CTAPS host site to all configured remote sites where it is then executed.

NRaD [SSC San Diego] is the single software support agency for CTAPS in the Navy and performs configuration management (CM) functions on all released software and documentation versions. For the past 5 years, NRaD has supported the Navy by designing, testing, and fielding CTAPS systems for use in the fleet. It currently exists on all four command ships, flat top amphibious assault ships, and all aircraft carriers.

"We are also responsible for identifying and providing Navy requirements for the follow-on to CTAPS system, the Theater Battle Management Core System (TBMCS). NRaD gathers these system requirements by participating in all naval exercises where CTAPS or JFACC is the focus. We work closely with NCCOSC In-Service Engineering, East Coast Division [SSC Charleston] to meet these obligations and have the support of both West and East Coast flyaway JFACCs of Commander, Carrier Group One and Commander, Carrier Group Four. We assist the primary contractor, Lockheed Martin Command and Control Systems, by providing Navy inputs and solutions to current and future system deficiencies," said Roy McConnaughey.

McConnaughey said that NRaD must now present the findings to the Chief of Naval Operations, Command and Control Systems Division, N62, in a conclusive test report.

"This test report will be consolidated with the Air Force and Marine's test reports and will be, in its entirety, the information used by the JCS to determine the joint acceptability of the CTAPS 5.2 software. If favorable, the system would be fielded worldwide this summer [1997] and would be the first major upgrade in over 2 years," he said.

Tandem Thrust '97: Medical Component Support

Medical Component of Tandem Thrust '97 (NRaD Outlook, vol. 20, no. 9, 2 May 1997)

NRaD [SSC San Diego] completed support of the medical component of the combined U.S./Australian military training exercise called Tandem Thrust '97 (TT '97). The exercise, which concluded in late March, was conducted in the Shoalwater Bay Training Area (SWBTA) in Queensland, Australia. It involved more than 28,000 military personnel, 40 ships, and 250 aircraft. A major portion

of TT '97 included carrier battle group and amphibious task group operations, amphibious landings, live fire exercises, ground maneuvers, and parachute landings.

The medical component of TT '97 included eight treatment and command sites. The primary medical care site was the combined U.S. Marine Corps/Australian Defense Force field hospital, located at Camp Sam Hill in the SWBTA. A second joint U.S./Australian facility was established at the Base Administrative Support Centre, Rockhampton, Australia. The USS *Independence* (CV 62), USS *Essex* (LHD 2), and USS *New Orleans* (LPH 11) provided medical casualty receiving and treatment facilities at sea. The Combined Exercise Control Group, located at Rockhampton, and the Commander Seventh Fleet (C7F) Surgeon, located onboard the USS *Blue Ridge* (LCC 19), provided command and control of the medical treatment sites. The task assigned to Code D42, Command and Intelligence Systems Division, was to develop, field, and support software for the C7F Surgeon. The software was designed to enter and track patients within the theater, record the medical condition of those patients, and track the operational status of the various medical treatment facilities (MTF) involved in the exercise. Doug Lange (D4221), Command, Control, Communications, Computers and Intelligence Systems Engineering and Integration, was chief engineer. He worked with the C7F Surgeon and his staff from mid to late 1996 developing a web-based solution using the TT '97 "Concept of Operations Annex Q" to define requirements. Stephen Ambrosius (D4221), software technical lead, worked the day-to-day engineering and implementation issues to bring the entire information system to life.

The web-based concept involved application of Windows 95-based graphical data entry forms. These were developed by Kimlan Huynh (D4221) to support entry of patient encounter information. The data entry forms also recorded MTF status information supporting medical planning and readiness. Completed encounter and status forms were automatically transmitted via electronic mail to a central database site located at NRaD and a mirror site located at Booz–Allen Hamilton, San Diego. Each site used a Java-based processor to correlate the incoming medical information and make it available on independent, redundant, revised World Wide Web sites. The TT '97 web data server supported all authorized users in the extraction and display of Annex Q Reports. The web-based reports, designed by Mai Nguyen (D4221), included hospitalization, disease, in-transit visibility, MTF status, and other related summaries. During the exercise, the C7F Surgeon requested a specialized report that tracked cases associated with the mosquito-borne disease Ross River Fever. This request was quickly accommodated.

In addition to the TT '97 medical web site, the contractor, BAH, developed a preventive medicine web site with information to prepare military personnel for the Australian environment. A number of poisonous snakes and ocean dangers were present in SWBTA, as were ticks, mosquitoes, and other insect dangers. Development and testing of the medical and preventive medicine web sites were conducted from December 1996 through February 1997. Preliminary web site evaluations were conducted by the C7F Surgeon and his staff, resulting in a product tailored to the user. Terri Johanesen (D4221) provided logistics and testing support for the TT '97 engineering effort with assistance from Stan Wichowski

(D4221), Minh Vo (D4221), and others. Stephen Ambrosius established the field sites and coordinated downloading of software by ships and other participating sites. Training and system support was also provided to the TT '97 site personnel. There were eight data entry sites and 17 web data user sites. Data were entered by members of the Navy, Marines, Army and Air Force, as well as the Australian Army and Navy. The resulting medical command and control information was used by both the U.S. and Australian governments. Establishment of the sites began 20 February with the Sam Hill MTF being brought on-line for the first patient entry. Full system operation at all participating locations was completed by exercise start on 10 March. A difficult task to overcome was establishing Inmarsat and commercial carrier connectivity, as well as Navy ship connections. These tasks were completed by Lee Skeen, Satellite Communications Resources Branch, D842, in the field and by Basit Syed, Dual Use Systems Engineering Branch, D723. In addition to supporting the TT '97 web sites, the communications configuration provided a high-speed 64-thousand bits-per-second data path for the movement of medical radiographic images from the MTF to the National Naval Medical Center, Bethesda, Maryland. Transfer of these images supported a very important component of the telemedicine concept used by TT '97 medical care providers. "The information technology provided by NRaD proved to be of great value to the success of Tandem Thrust. The technology provided demonstrated that a minimum footprint, low administrative cost, user friendly, and command responsive system can be achieved," said Medical Information Engineering Manager Jim Privee, D4221.

Naval Computer Telecommunications Area Master Station (NCTAMS)

NRaD Helps Move NCTAMS Equipment and Provides Communications Support (NRaD Outlook, vol. 20, no. 11, 30 May 1997)

The Naval Computer Telecommunications Area Master Station (NCTAMS) in Bagnoli, Italy, was tasked with moving their communications network base of operations from Air Force South Headquarters, North Atlantic Treaty Organization base, into new facilities at Capodichino Airport, a distance of 10 kilometers. They were faced with the concern of transporting the AN/WSC-5 communication systems intact, without loss of communication linkage capabilities during this move. NCTAMS uses satellite communications to provide the Navy with a communications link and as the source for fleet broadcast messaging systems.

The solution to this problem was available through the mobile vans program. NRaD [SSC San Diego] has been designing and constructing a series of mobile vans for the military that can be transported where needed to provide instant communications support in a variety of situations. One of the vans, the Advanced Base Functional Component (ABFC) Command, Control, and Communications (C^3) A van, is a transportable communications component used to provide local and long-haul communications to support a small naval station or naval air facility, including common user access to NCTAMS. It provides a complete communications package for crisis or contingency operations. This van offered the possibility of filling in for the NCTAMS station while equipment was being moved. Code D341, the Mobile Systems Branch, and Code D623, the

Ultra-high-Frequency (UHF) Satellite Communications Branch teamed up to provide planning, alternate capability, and full operational support throughout the NCTAMS move, with no break in service.

To carry out the task, the ABFC C3A van underwent significant modifications to install two additional VICS (Versabus Modular Eurocard Integrated Communications Systems) terminals to double the capacity of the van. In this configuration, the van capability was increased to 12 radio frequency full duplex UHF channels and up to 36 DAMA (Demand Assigned Multiple Access) port capacity.

Doug Hawthorne, Code 341, spearheaded the technical details of the ABFC C3A van installation and operation. Don Ames, Code 623, organized the AN/WSC-5 relocation effort. Hawthorne spent nearly 3 months in Italy team-leading the AN/WSC-5 physical move along with the intricacies of the van substitution.

"We set up the van to serve as an 'NCTAMS in a box' while we relocated the hardware to the new location," he said.

The move, which took nearly 3 months from start to finish, began in late December 1996. Personnel from NCTAMS MED (located in Bagnoli, Italy), ABFC Navy Reserve units, and contractor personnel began working with Hawthorne to plan for the NCTAMS hardware to be moved in sections. The actual relocation of the two AN/WSC-5 suites, which included the transceivers and a variety of channels each roughly the size of an average office cubicle, was accomplished using flatbed trucks to haul portions through the narrow and crowded streets of Italy. "This was a tough effort," said Hawthorne. "The traffic and the roads were not designed to accommodate such endeavors. I have a great deal of respect for the drivers who performed the task."

Hawthorne explained that as the AN/WSC-5 was moved in pieces and each channel was inoperative while in transit, the ABFC C3A van served as a backup for that channel.

"Each AN/WSC-5 provides eight channels for a total of 16 different channels produced by the pair of suites. Each channel in turn was backed up by the van to provide seamless circuit maintenance capability for the fleet-critical communications. This achievement eliminated excessive outages associated with the entire Mediterranean fleet during the NCTAMS move," he said.

The ABFC C3A van is maintained and operated by Naval Reserve personnel. The mission of the move integrated over 70 reservists from seven different units into the daily operation of the NCTAMS. Extensive planning and coordination was carried out during a period of several months by the Naval Reserve ABFC units located in Cheltenham, Maryland, along with Commander, Naval Telecommunications Command (COMNAVTELCOM) in Washington, D.C., and the NCTAMS MED staff. The training and planning enabled the reservists to make the initial operational deployment of the ABFC C3A van a success. A congratulatory message from NCTAMS MED Naples, Italy (161906Z Mar 97) stated in part, "Restorative capability passed seamlessly to the van, permitting disassembly and removal of our WSC-5 UHF transceiver equipment as

scheduled. The team's own technical expertise resolved the vast majority of technical issues with only minimal support from us. For a period of 10 weeks, the ABFC C3A van maintained numerous circuits critical to the Fleet—without missing a beat."

Plans are currently underway for a similar support effort to take place at NCTAMS, Guam. The van has been tasked to provide WESTPAC (Western Pacific) with radio frequency channels and DAMA ports during the NCTAMS, Guam AN/WSC-5 satellite groom scheduled for a 3-week period in July/August 1997.

Based on the Italian achievement, the ABFC van is now scheduled to support relocation of the entire AN/WSC-5 backup NCTAMS system from Stockton, California, to San Diego in October 1997. The mission for the van in this effort will be to act as alternate controller for the Hawaiian station, NCTAMS EASTPAC (Eastern Pacific).

ICESHELF-97

Iceshelf-97 Places Acoustic Array Beneath Arctic Ice Pack (NRaD Outlook, vol. 20, no. 13, 27 Jun 1997)

Iceshelf-97, the 1997 arctic field experiment for Project Spinnaker, was conducted from March 31 to May 3. Project Spinnaker is a joint U.S./Canadian effort to place a large-aperture acoustic array beneath the arctic ice pack in the Lincoln Sea area where it would cover most of the Arctic Ocean basin.

"This was a challenging project which demanded development of leading-edge technology in the areas of lightweight low-power acoustic arrays, optical telemetry, and autonomous undersea vehicle (AUV) development and operation. The difficulties involved in normal ocean optical telemetry cable systems and undersea acoustic arrays are amplified many times by the demands of the severe arctic climate and by an ocean covered with many meters of solid ice that may drift, shift, or break up unpredictably at any time," said Dr. David Rees of the Acoustic Branch, D881.

Each complete array segment fits in a large trash can, has 20 or 22 elements, and spans roughly half a kilometer. Each node is a small cylindrical pressure vessel 1 to 2 meters long. The deployed array had roughly a 2-kilometer horizontal aperture. The arrays and node telemetry system were developed in Code D881. Code D881 was also responsible for U.S. project management and array development. Code D746, Advanced Concepts Branch, also developed the optical telemetry. Many NRaD [SSC San Diego] codes contributed to the project.

In Iceshelf-96, a large array was successfully installed in the target area and linked via fiber optic cable to Canadian Forces Station Services (CFS) Alert, a Canadian Forces arctic station located at the northern tip of Ellesmere Island, Canada. The arrays and nodes were deployed through holes drilled in the ice, pulled from hole to hole, and lowered in the final configuration to the sea bottom 560 meters below. Because the arrays had to fit through the small ice holes, they had to be lightweight and low-power. The entire array consisted of seven seg-

ments forming a U-shape, with two vertical arrays at the end spanning essentially the entire water column, four horizontal segments on the bottom between the verticals in an east-west line, and a perpendicular stub. Three laser-telemetry nodes that controlled the array and communicated with shore, were also lowered through the ice holes. The optical telemetry fiber cable connected to shore was laid by the Canadian autonomous undersea vehicle (AUV) Theseus.

An AUV capable of guiding itself without control from shore was necessary because the array site was roughly 160 km from the shore and the ice cover prevented any connection or control from the ocean surface. Theseus contained a series of fiber optic cable spools in its cargo bay spliced together to form an over 200-km continuous cable. The optical cable was deployed from Theseus as it drove itself under the ice 160 km to the array site, with occasional updates from acoustic beacons lowered through ice holes. On arrival at the site, the vehicle rose and flew through a "catcher" loop suspended from the ice, allowing the fiber to be retrieved to the surface and spliced to the array fiber, thus completing the connection to shore.

"Using inertial navigation, Theseus was extraordinarily accurate, with navigation errors kept to within tens of meters over the full swimming path. The 160-km-long optical telemetry link from the array to CFS Alert is thought to be the longest active optical link in the world without repeaters. The only lasers in the link are at the ends of the link, with nothing but optical fiber in between. The quality of the link was so high, that the receive optical amplifiers at CFS Alert had to be detuned to avoid saturation; signal excess was roughly +17 dB," Dr. Rees said. Dr. Rees said the array gathered the world's first high-quality, long-term continuous acoustic data set for the Arctic Ocean. The large aperture and full water column coverage allow high directional resolution and accurate modal decomposition of incoming acoustic energy. A real-time processing system at Alert analyzed the incoming data in terms of directional beams, modes, and other factors, in addition to recording the raw data. The data set is of interest for a number of reasons, including understanding Arctic Ocean dynamics, ice pack dynamics, various acoustic signals, and global warming. Unfortunately, telemetry to the array was lost after several months of operation. The cause for the telemetry loss could have been an optical fiber cable break or a primary node failure. The U.S. and Canadian teams developed plans to repair either type of failure. They returned to the arctic this year for Iceshelf-97 with goals of finding the cause of loss of telemetry, demonstrating node replacement or arctic fiber-optic cable repair as required, and returning the array to recording status.

Key U.S. participants included Dr. Dave Rees (U.S. project management and software), Mike Brininstool (optical telemetry system), Bill Marn (node designer), Willie Stevenson (fiber-optic cable expert), and Todd Webber (array retrieval and deployment). Dr. Barbara Sotirin has been U.S. project manager for Project Spinnaker for most of the life of the project but is currently on 1-year assignment to the Office of the Secretary of Defense.

The U.S. team arrived at CFS Alert on 1 April with temperatures running approximately minus 40 degrees. The Canadian team had arrived several days earlier and prepared equipment at Alert for operations. Transport to the arctic ice pack from Alert was, as usual, by air: a Twin Otter small aircraft with skis that

can land on an ice pan, and a rented helicopter to sling loads and access small landing areas.

The team returned to the exact array site using GPS (Global Positioning System) navigation, and after the ice pack stabilized, the necessary holes were drilled through the ice. A tethered remotely operated vehicle (ROV), equipped with special attachments, manipulators, and video cameras, was lowered through the 6-meter-thick ice hole. An operator on the ice surface controlled the ROV via its umbilical cable. The ROV located the primary node via sonar and dove to the array site. The fiber optic cable was retrieved to the ice surface by the ROV from the half-kilometer depth but was unfortunately broken when a fault occurred in the ROV control electronics. The plan had been to assess the array health via the retrieved fiber, but the fiber break necessitated going to the full node repair plan. This required attaching a line to the node via the ROV, stringing the line in a carefully planned configuration, and carefully peeling the array up from the sea bottom. Excessive tension could break and destroy the entire array.

After considerable on-the-spot problem solving, the team succeeded in retrieving the node to the surface. A new node was spliced into the array, new battery packs attached, and the entire array was verified operational using an on-ice data analysis unit at the splice hole. The array was then deployed back to the sea floor and verified fully operational after deployment. The fiber-optic pigtail from the node was spliced to the landward fiber cable and dropped away, completing the node replacement. "So far as we know, this was the world's first at-site node replacement on an operating array, with the array verified operational after redeployment. Tests of the retrieved node verified that it was operational at the time of retrieval. The cause of loss of telemetry to the array was thus shown to be a fiber break 10.62 km from the array site (about 150 km from shore). The fiber break was located using an optical time-domain reflectometer (OTDR) from the retrieved cable at the array site. Severe ice motion resumed within 12 hours of completing the node replacement and unfortunately precluded repair of this fiber break. If the ice motion had resumed during the node replacement procedure, the array would have been destroyed, making this truly a nick-of-time operation; or, as one Canadian put it, 'the ice gods were with us,'" Dr. Rees said.

Dr. Rees said that another fiber break closer to shore was successfully repaired by retrieving both ends of the broken fiber via ROV to holes in the ice surface and splicing in a new fiber optic cable segment between the retrieved ends.

"This repair demonstrated using an OTDR and reflected characteristic change on fiber manipulation to ascertain which of two fibers was the desired (correct) shoreward fiber. This was a new development so far as we know. This splice repair was verified as very successful using OTDR from shore, and thus became the world's first under-ice fiber telemetry cable repair. Unfortunately, due to the onset of bad weather and continued ice motion, the fiber cable break 10.62 km from the array site could not be repaired in the time frame of the experiment. Nonetheless, Iceshelf-97 continued in the tradition of Project Spinnaker demonstrating world firsts in an extremely demanding environment. The Iceshelf-97 team members should be commended for their creativity, ingenuity, and hard work in devising on-the-spot solutions to the problems encountered, with no injuries or safety failures in the harsh arctic," Dr. Rees said.

Radio Propagation Over Terrain (RPOT) System

New Radio Propagation Assessment System Developed (NRaD Outlook, vol. 20, no. 10, 16 May 1997)

NRaD [SSC San Diego] has developed a new radio propagation assessment system that accounts for the combined effects of atmospheric ducting and terrain on radar and radio coverage. The Radio Propagation Over Terrain (RPOT) program combines the latest radio propagation models, atmospheric data from many sources, and the Digital Terrain Elevation Data maintained by the National Imagery and Mapping Agency.

RPOT has been distributed Fleet-wide and is also being used by the other Services. RPOT is now serving as the basis for the next-generation propagation assessment system known as the Advanced Refractive Effects Prediction System (AREPS), which will replace the Integrated Refractive Effects Prediction System (IREPS) developed in the 1970s.

The new radio propagation assessment system was developed by the Tropospheric Branch, Code D883, under the Naval Technology Insertion Program (NTIP) to account for the combined effects of atmospheric ducting and terrain on radar and radio coverage. The required atmospheric data is normally available on existing local area networks and the Digital Terrain Elevation Data (DTED) is available directly from CD-ROMs or via the SIPRNET (Secure Internet Protocol Router Network). RPOT computes coverage diagrams for all bearings of interest and then rapidly displays them in sequence similar to a scanning radar, either in full 360-degree rotations or in sector scans, thus creating an easy to interpret three-dimensional display. The operator can stop the rotation, move one bearing backward or forward, read out height and range easily with a mouse cursor, or print out the desired diagram.

RPOT was developed in a very short time for such a complex system. The idea was written up for the Office of Naval Research "Technologies for Rapid Response" (Blue Book) in June 1995. In October 1995, Commander in Chief, U.S. Naval Forces Europe (CINCUSNAVEUR) and Commander, Sixth Fleet (C6F) expressed an interest in this proposal for use in support of the Bosnia Peace Mission, especially in assessing the coverage of the acquisition radars associated with the SA-6 missile system. In December 1995, a decision was made by NTIP to fund the effort, and a 6-month schedule was agreed upon to deliver the final product to C6F. Partial capability deliveries were made in January and April 1996, and by June 1996 a full-capability program and Pentium lap top computer were delivered to the C6F Flagship USS *La Salle* (AGF 3). The 6-month schedule was met and the project was slightly under budget. The entire effort was performed in house at NRaD. Rear Adm. Paul Gaffney II, Chief of Naval Research, in recent comments specifically about RPOT said, "These are real capabilities supporting deployed units in an ongoing military mission and they provide testimony to the success and relevance of the Blue Book."

Since the delivery to C6F, RPOT has been distributed Fleet-wide. This distribution is supported by the Commander Naval Meteorology and Oceanography Command (CNMOC) and the Space and Naval Warfare Systems Command

Meteorology and Oceanography Systems Program Office (PMW-185). It is also being used by other Services and has been very successfully used by the Special Operations Forces in counter drug efforts in Central America under Operation Laser Strike.

There are currently hundreds of RPOT users worldwide. RPOT was a onetime development, but it is now serving as the basis for AREPS. NRaD personnel involved in the RPOT development are: Amalia Barrios, Gary Lindem, Herb Hitney, and Wayne Patterson (all D883); Linda Hitney (Ionospheric Branch, D882); Naval Science Assistance Program Science Advisor Jim Price at CINCUSNAVEUR; Russ Vorce, Ron Seiple, and Terry Hoffman (Fleet Assistance Office, D12); and John Barnes (Marine Mammal Research and Development Branch, D351).

GPS Central Engineering Activity

Ribbon Cutting Held for New GPS Central Engineeing Activity (NRaD Outlook, vol 20, no. 12, 13 June 1997)

A ribbon-cutting ceremony was held 2 June 1997 for the new Global Positioning System (GPS) Central Engineering Activity (CEA) Laboratory at Bayside, Building 1. At the ceremony, George Kosmos of the Global Positioning Systems Division, Code D31, proudly announced the grand opening and praised the team who successfully relocated the laboratory from Warminster, Pennsylvania, to San Diego.

"Under usual circumstances a transition such as this might have been planned differently," Kosmos stated. "We worked with what we were dealt—diverse people with diverse backgrounds—and we coalesced them into a common environment where they worked together to successfully reestablish the CEA Laboratory in San Diego."

Kosmos also added that, much to their credit, the team did it ahead of schedule, which is an indication of both their dedication and their individual abilities brought together for a common objective. In conclusion, Kosmos expressed his appreciation and congratulations and applauded the team that made it all happen. After getting an affirmative response to his question, "Does it work?," NRaD [SSC San Diego] Commanding Officer CAPT Hal Williams performed the ceremonial ribbon cutting. The GPS User Equipment (UE) CEA has been the Navy's lead laboratory for developing GPS receivers. The CEA was established in 1980 in Warminster, Pennsylvania. The Base Closure and Realignment Commission (BRAC) 93 directed relocation of the Warminster Detachment to San Diego. During the lab's relocation to its new permanent home in San Diego, the CEA Laboratory functioned without interruption at a temporary site in Imperial Beach. As with the Warminster facility, the new lab is a unique state-of-the-art facility providing GPS user equipment with a development, integration, test, and evaluation environment. Through real-time simulation of both GPS satellite signals and host-vehicle communications, the facility exercises GPS UE hardware and software dynamically under precise laboratory conditions. Environments can be exactly replicated as many times as needed.

Some of the broad repertoire of laboratory capabilities are testing the Precise Lightweight GPS Receiver; remedial action verification of the Rockwell Collins 3A and 3S receivers; providing the environment for the software support activity (SSA) for the GPS flight software aboard the Tomahawk Land-Attack Missile; evaluating navigation performance and operational use for candidate receivers used in Somalia; embedded GPS inertial (EGI) testing; and GPS Versa Module EuroCard (VME) Receiver Card (GVRC) testing. The laboratory's unique ability to perform this range of testing is provided through a special combination of features housed within one facility.

Joint Maritime Command Information System (JMCIS)

NRaD signs CRADA with Sun Microsystems to Develop/Test JAVA (NRaD Outlook, vol. 20, no. 12, 13 June 1997)

Sun Microsystems Federal, Incorporated and NRaD [SSC San Diego] signed a Cooperative Research and Development Agreement (CRADA) early this year. This culminated a year-long effort to establish a mutual technology development exchange beneficial to both private and public sectors. Sun Federal and NRaD will jointly develop and test a methodology to reengineer very large software systems by integrating Sun's new network centric programming language JAVA (Sun Microsystems' trademark name). JAVA is platform independent so that the same language code will run on all major computer platforms. The objective of this CRADA is to mitigate the risk of reengineering the Joint Maritime Command Information System (JMCIS) ashore command and control software system via new technology. Increased functionality and reduced life-cycle support costs can be achieved by a greater use of World Wide Web technology coupled with use of the JAVA language and associated virtual machine. This new approach will focus on delivering information to the warrior at a richer level of abstraction than traditional text messages. JAVA will be integrated into the Navy's web-oriented, N-tiered application framework. In this CRADA, Sun will provide the underlying JAVA technology and the Center will perform the systems engineering, development, integration, and testing. The principal investigator at NRaD is Michael Kono, Code D4221, Command, Control, Communications, Computers and Intelligence (C^4I) Systems Engineering and Integration. Kono heads up a small team of NRaD engineers including George Chen, Glenn Tolentino, Rick Cruz, Mike Moser, and Tien Tran. The effort is supported by many at NRaD across codes. In addition it is supported by a larger JMCIS funded JAVA engineering, development, and integration (JEDI) team of contractors.

Reengineering JMCIS began in November 1994. At that time Mike Kono, Mark Postal (currently a North Atlantic Treaty Organization contract engineer), and Rick Cruz developed a prototype client/server architecture that targeted the ability to do database query applications with three basic software modules and no coding. From that initial effort came the concept of normalizing data flow and its representation in the system and the decoupling of the presentation layer from the data layer. Implementation of JMCIS software via JAVA is the starting point for allowing the underlying infrastructure to be moved from a "fat" client/server construct to the low total cost of ownership thin-client model. This is critical for the Navy to be able to meet emerging JMCIS requirements in an era of diminish-

ing budgets and increasing requirements. By summer of 1995, funding provided by Supreme Allied Commander Atlantic (SACLANT) allowed for creation of a prototype message processing architecture written in C and C++ based on these concepts. This prototype system was tested at Commander in Chief, U.S. Pacific Fleet (CINCPACFLT) in October of 1995. Low-level prototyping continued and by March of 1996 the system was tested again by CINCPACFLT and Commander in Chief, U.S. Atlantic Fleet (CINCLANTFLT) to transmit, receive, and process status of resources and training system database and casualty report message traffic.

Development during this phase was augmented by the contributions of Joe Discar (contractor from Syzygy), Glenn Tolentino, Patty Diercks, Ernest Songalia (contractor from Fuentez), and others on the JMCIS ashore team. The results indicated that system performance due to inter-process communication links between tiers was not a problem. In addition, the test allowed the NRaD team to get feedback from the fleet operators on the multi-platform user interfaces provided by the new software. "To our surprise, the users were not impressed with the cross-platform (MOTIF and MS Windows) interfaces and instead pressed for a web interface. Within a month (April 1996) of that feedback, the decision was made to move to JAVA to generate a sufficiently interactive UNIX International within a web browser. Negotiations continued with Sun Federal, and by mid-1996, agreement was reached in principle to build a message-handling foundation based on the N-tiered client/server approach in a JAVA implementation. The objective of the CRADA was to demonstrate that a mission-critical application system could be developed in JAVA. There are obvious commercial benefits to be realized if the CRADA is successful in the area of enterprise reengineering and electronic commerce implementation," Kono said.

"Brenda-Lee Karasik, Code D14, Science and Technology, proved to be instrumental in bringing the agreement to closure between Sun and NRaD. Although not a contract, the CRADA required much liaison work between NRaD, Sun, and the Office of Naval Research initially, and then between NRaD and Sun to make it finally a reality," Kono said.

Joint Warrior Interoperability Demonstration (JWID) 97

NRaD Demonstrates "Unity of Purpose" in JWID 97 (NRaD Outlook, vol. 20, no. 14)

(Note: This article was published prior to JWID 97; see the technical accomplishments section for specific JWID achievements.)

This year the U.S. Navy is the lead service for the Joint Warrior Interoperability Demonstration (JWID) 97, the eighth in a series of demonstrations sponsored by the joint staff. The JWID theme of "Unity of Purpose" describes the demonstration of existing, new, and evolving technologies and methods designed to address real command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR) issues in a joint and coalition environment.

Steve Musson, Code D4514, Joint Interoperability Engineering, who serves as assistant technical director to the JWID Joint Program Office, stated, "JWID 97

provides a unique opportunity to bring innovation into the tactical operational environment."

Though the JWID 97 host is Commander, U.S. Atlantic Command, NRaD [SSC San Diego] and Commander, Third Fleet, onboard the USS *Coronado* (AGF 11) are participating as JWID 97 secondary sites.

The use of a coalition wide area network (CWAN) as the communications backbone for JWID is the single biggest change from previous demonstrations, according to the director of this year's event. The CWAN will connect all primary sites including the USS *John C. Stennis* (CVN 74), USS *Nassau* (LHA 4), USS *Atlanta* (SSN 712), Camp LeJeune, Barksdale Air Force Base, Army assets at Fort Gordon, the Pentagon, and the Joint Battle Center. Key secondary sites will be connected such as the USS *Scranton* (SSN 756) and USS *San Jacinto* (CG 56). The CWAN also links the following nations into the JWID demonstration: Australia, Canada, France, New Zealand, Spain, the United Kingdom, and NATO.

"In terms of unity of effort, NRaD's contributions to JWID 97 cross a wide variety of functions from graphic support for the JWID Joint Program Office to actual technology demonstrations," Musson said.

Products developed by the Presentations, Multimedia, and Photo Branch, Code D0272, have been integral to creating a successful JWID 97. A wide range of multimedia products for the Joint JWID Program Office, from informational brochures to creative video presentations, will be used during the visitor and media days.

NRaD formally sponsored the JWID 97 demonstration of the 3-D Volumetric Display which will be showcased on the USS *John C. Stennis*. Parviz Soltan and other engineers from Code D44215, Human Systems Interface Technologies, will demonstrate how Link-16 positional data can be spatially displayed to increase situational awareness for the warfighter.

A first for JWID is the involvement of submarines. The USS *Atlanta* will showcase 12 demonstrations geared to demonstrate technological solutions to interoperability issues between the submarine and the joint or coalition task force commander. NRaD's involvement in the onboard demonstrations of Common Operational Modeling, Planning, and Simulation Strategy (COMPASS), Joint Maritime Communications Strategy (JMCOMS), Integrated Situational Awareness, and Sensor to Shooter are key to illustrating this capability.

The USS *Scranton* has a special opportunity in JWID to foster the Navy's information technology for the 21st century by demonstrating an advanced mini-DAMA (Demand-Assigned Multiple Access) waveform capability which provides an unprecedented increase in data exchange rate via a single ultrahigh frequency channel. Laura Anderberg, D8305, Technical Staff of the Submarine Communications and Command, Control, Communications, Computers and Intelligence (C^4I) Systems Division, is the submarine demo project manager in support of the Office of the Chief of Naval Operations.

Roger Casey of the Information Systems and Network Technology Division, Program Management and Technical Staff (D8205), the Radio Frequency Net-

works Branch (Code D824), the Information Systems and Network Applications Branch (D821), and NCCOSC In-Service Engineering, East Coast Division [SSC Charleston] are providing valuable support to the JWID Multi-National Task Group. The group is a notional coalition task force that will demonstrate enhanced coalition information exchange and improved command, control, and communications effectiveness and interoperability using ACP-123/X.400 (Allied Communications Publication) messaging between maritime forces from Australia, New Zealand, Canada, the United Kingdom, and the United States. This demonstration will include evaluation of multi-cast messaging and message receipt during emission control (EMCON).

Specific demos with significant NRaD involvement include: Modeling and Simulation to C^4I in the DII COE (Defense Information Infrastructure Common Operating Environment) warfighting environment led by Cmdr. Donald McSwain; Situational Awareness Beacon with Reply (SABER), led by Ron Bell, Cindy Sherwood, and LCDR Tracy Conroy; JMCOMS Infrastructure led by Mel Landis; and Integrated Situational Awareness, led by Judy Boland.

Fully involved in JWID 97, the Maritime Battle Center (MBC) [MBC became the C^4ISR Systems Integration Environment (SIE) in early 1998], located at NRaD, is providing support to the San Diego secondary sites and demonstrations. Rick Morgan, program manager of the MBC, pointed out that JWID 97 provided the maritime community the opportunity to demonstrate unity of purpose through the employment of the MBC.

"Just as the JWID 97 objectives are in consonance with the unity of purpose theme, the MBC Phase I objectives are in keeping with facilitating an integrated test environment for local JWID 97 demonstrations and infrastructure. The MBC has capitalized on JWID 97 as a Phase I opportunity to formally step through and evaluate the key processes associated with collaborative engineering and technology insertion in an integrated lab environment," Morgan said.

Cmdr. Lysa Olsen, JWID Acting Director for the Maritime Battle Center, stated, "For JWID 97, the MBC process is demonstrated by a partnership between the Maritime Battle Lab (MBL), a naval C^4ISR lab capability, and Commander, Third Fleet's Sea Based Battle Lab (SBBL). Together they demonstrate the engineering tools and processes that support rapid technology insertion and the evaluation of technology in an operational environment."

In support of the MBC Phase I evaluation in JWID, a team of key engineers were assigned to facilitate the efforts of the MBL, SBBL, and local demonstrations. Delores Washburn, Life Cycle Engineering Support Branch, Code D651, led this effort as the MBC Phase I test coordinator. The Phase I goals for the MBC include collaborative engineering, technical support, and operational presence.

The MBC team facilitated collaborative engineering by developing a CWAN network at NRaD that provides CWAN access to the five local labs and seven demonstrations. The MBC network engineer, Rico Cheng, Networks Technology Branch (Code D827), coordinated this effort. MBC senior systems integration engineer, Raymond Barrera, Test and Evaluation (Code D4524), coordinated creation of a C^4ISR test to simulate an operational environment for integration and testing. The Sea-Based Battle Lab systems engineers, John Ross and Chris

Poulos, engineered the CWAN enclave onboard the USS *Coronado* which will be a "leave behind" for future work with the Sea-Based Battle Lab. They will also provide technical support during the ship's underway period during the demo assessment phase of JWID. The install team for the USS *Coronado* is led by Jim Acosta, Command and Control Implementation Branch (Code D645).

Additionally, during the JWID 97 demo assessment phase (14–31 July), both the MBL and the SBBL will simulate operational roles to enhance demo play in the scenario. The Sea-Based Battle Lab will alternate roles as a notional guided missile destroyer (DDG), arsenal ship, joint intelligence center (JIC), or Joint Force Air Component Commander (JFACC). The MBL will serve as a notional guided missile frigate (FFG) and as a supporting CINC (commander in chief) in an adjacent area of responsibility (AOR). These capabilities will be demonstrated by a team of active and reserve military operators at both the SBBL on USS *Coronado,* which will be underway for JWID 97, and the MBL Operations Center, which is hosted in the NRaD Reconfigurable Land-Based Test Site (RLBTS) lab in Building 600.

"The value added provided by MBC participation is that engineering, integration, and functional interoperability are achieved within a lab or development environment, with the benefit of warfighters' operational insights, prior to the technology being implemented onboard operational platforms," said Rick Morgan. "JWID 97 is a collaboration of military and civilian, joint and coalition, lab and operational unit all focused on identifying the right C^4ISR technology for the future. This unity of effort will be readily evident during the JWID 97 visitor period (July 28–31)," he said.

Cryptographic Repair Facility

Code D653 Solves Long-term Problem (NRaD Outlook, vol 20, no. 16, 8 Aug 1997)

The NRaD [SSC San Diego] Cryptographic and RADIAC (Radiation Detection, Indication, and Computation) Systems Branch, Cryptographic Repair Facility (CRF) (Code D653) located at the 32nd Street Naval Station, recently received a telephone call for help from the 14th Engineering Squadron, Royal Canadian Air Force, headquartered in Greenwood, Nova Scotia. The KG–40 crypto key generators on their P3 Orion aircraft were failing due to a lack of a good ground connection within the units, creating erratic signals. A circuit board in the original and updated versions of the KG–40 did not provide a common ground between circuity and the chassis.

The U.S. Navy and the National Security Agency have been dealing with this problem for a long time. The Canadian engineering squadron had a repair procedure produced by the United States Government a few years back and asked D653's CRF to review it. The CRF had no prior knowledge of the problem or the repair procedure.

After a review of the suggested fix, CRF shop manager Bill Schleiger and bench technician Steve Geller were not satisfied with the procedure and analyzed the problem further. Within 2 hours, they produced a procedure that was better,

cheaper, and simpler. Unlike the official Navy fix, it required no special or additional parts. The fix can be accomplished within 20 minutes. This repair procedure will affect and correct all KG-40 and KG-40A systems in the U.S. Navy and Allied Forces.

Branch head Joe Bullock said, "I am proud of the efforts of Bill Schleiger and Steve Geller in solving this Fleet-wide problem. The combination of Bill's 17 years of crypto experience and Steve's ability to adapt and learn new technology (he started working on crypto equipment only 9 months ago) produced a successful team solution."

This new procedure has now been field tested by the Canadian Air Force. Excellent results were reported and this method is currently being analyzed by the Space and Naval Warfare Systems Command (SPAWAR), Navy Information Security (PMW-161), and the National Security Agency. It is hoped that the procedure will soon be incorporated throughout U.S. and North Atlantic Treaty Organization services.

Mobile Ashore Support Terminal (MAST)

MAST Enters Final Phase of Integration, Testing, and Training (NRaD Outlook, vol. 20, no. 17, 22 Aug 1997)

The final phase of integration, testing, and training is currently underway for the redesigned and upgraded Mobile Ashore Support Terminal (MAST). Navy crews from Mobile Inshore Undersea Warfare (MIUW) and harbor defense commands are currently training on the system, which is located temporarily at Seaside. Upon completion of training, the system will be stationed at MIUW Group One at Imperial Beach and prepared for its initial deployment in September to Quantico, Virginia.

MAST is a completely self-contained command center with command and control systems and support systems for decision makers and data processors. It is intended to provide Navy commanders who deploy ashore the same communications and command and control capabilities available aboard ship. It deploys with its own shelters, electrical generators, and air conditioning. MAST offers communication links to joint commands and Navy forces at sea. The system includes line-of-sight voice and data communications capability in the high-frequency (HF), very high-frequency (VHF) and ultrahigh-frequency (UHF) bands. Satellite communications cover the UHF and super high-frequency (SHF) bands. An INMARSAT (International Maritime Satellite) telephone system provides telephone service in remote locations. The command and control suite is based on Joint Maritime Command Information System (JMCIS) Unified Build 2.2, which is the Navy's standard command and control package. JMCIS provides a tactical display of both naval and ground forces, a briefing system, and the ability to send and receive secure e-mail.

The prototype version of JMCIS 98 is included. Joint Deployable Intelligence Support System (JDISS) software loaded on one of the JMCIS workstations provides intelligence and imagery support. Naval Modular Automated Communications System II (NAVMACS II) and fleet broadcast receivers allow the unit to send and receive record message traffic.

"Should a need arise for the MIUW or harbor defense commands to deploy, they would pack out MAST on a military aircraft and fly away. They would unpack, set up the tents and communication equipment, and be operational in half a day," said lead systems engineer Gordon Mattis of Code D4204, Director, Command, Control, Communications, Computers and Intelligence (C^4I) Systems, Hawaii.

Four units were built in 1994–1995 for active duty units assigned to each fleet commander-in-chief. Most have been on 10 or more deployments over the last 2 years, including exercises Cobra Gold in Thailand and Bright Star in Egypt and the evacuation of the American Embassy in Liberia. The MAST currently being tested, and two others now under construction for Naval Reserve forces, are evolutionary upgrades incorporating emerging technologies, for example, SHF satellite communications capabilities.

MAST is a team effort of Space and Naval Warfare Systems Command (SPAWAR) and former NCCOSC. NRaD [SSC San Diego] was the design agent and produced the first article. Program manager was the SPAWAR Navy Command and Control System Program Office (PMW 171). NCCOSC In-Service Engineering, East Coast Division (NISE East) [SSC Charleston] is the in-service engineering activity and will build the second and third of the new systems. Mattis was systems engineer and head of the design team. Todd Almond of C^4I Systems Engineering and Integration (Code D4221) was the primary system integrator with some modules produced by Blayne Cannon at NISE East. Production and software integration team members were Rich Sylvestre, Tom Moore, Doug Hawthorne of the Mobile Systems Branch (Code D341), Jessie Lopez, George Eastwood, Tommy Robbins and Karen Cannon. Logistics support was provided by Annette Macintosh. Electronic Technician First Class Dave Dobry, leading petty officer from the Commander-in-Chief, Atlantic Fleet Mast Unit, provided assistance during the final operational tests and crew training.

Mobile Detection Assessment Reponse System (MDARS)

MDARS Receives Another Patent (SSC San Diego Outlook, vol. 20. No. 22, 14 Nov 1997)

Patent No. 5,659,779, System for Assigning Computer Resources to Control Multiple Computer Directed Devices, was awarded to Bart Everett, Code D3701, Advanced Systems Division Associate for Engineering; and Gary Gilbreath, Robin Laird, and Tracy Heath-Pastore, Code D371, Adaptive Systems Branch.

"This patent covers what we call our MRHA, which stands for Multiple Resource Host Architecture," said Bart Everett who serves as technical director for the joint Army/Navy Mobile Detection Assessment Response System (MDARS) program.

"In a nutshell, it's a sophisticated command and control architecture that can provide supervised autonomous control of a number of indoor and outdoor security robots, much like the one we had running last year Topside in Building 33," he said.

At the recent MDARS integrated product team design review held several weeks ago, the MRHA successfully coordinated the actions of four interior robots running in three different remote locations.

"We had our console set up in the Commander's Briefing Theatre controlling robots at Building F–36 Seaside, our Camp Elliott warehouse facility by Miramar, and our newest installation at Anniston Army Depot in Alabama," Everett said.

Fifteen patents have been awarded to various members of the MDARS team for innovations in the field of robotics over the past several years.

Pacific Missile Range Facility (PMRF)

PMRF Communication Systems Upgraded by Code D335 (NRaD Outlook, vol. 20, no. 18, 19 Sep 1997)

Air Surveillance and Ranges Branch, Code D335, is the lead field activity responsible for a major communications upgrade installed at Pacific Missile Range Facility (PMRF), Barking Sands, Hawaii, under the Central Communications Network Upgrade program (CCN–II). This project represents years of planning, design, installation, and integration efforts producing turnkey systems that support the Fleet.

PMRF is located on the island of Kauai, the most western island of the Hawaiian Island chain. PMRF provides major range services to facilitate training, tactics development, and evaluation for air, surface, and subsurface weapons systems for the Pacific Fleet, Department of Defense agencies, and foreign military joint exercises. PMRF is the world's largest multi-environment range capable of supporting underwater, surface, air, and space operations. A thousand square miles of underwater range and over 42,000 square miles of controlled airspace make PMRF a premier facility for supporting operations which vary from small, single-unit exercises up to large, multiple-unit battle group scenarios.

The CCN–II program was established to modernize the communications system at PMRF to meet new demands and support the Fleet. To achieve modernization of PMRF's communication network, upgrades were implemented in the following areas: underwater communications, digital switch equipment, high-frequency (HF) radio communications, very-high-frequency (VHF)/ultrahigh-frequency (UHF) radio communications, FM (frequency modulation) mobile network communications, microwave links subsystem, video monitoring subsystems, local area network/wide area network (LAN/WAN) subsystems, satellite communications (SATCOM), and remote maintenance and monitoring subsystems (RMMS).

The majority of the modernization process involved integration of commercial off-the-shelf (COTS) communication equipment. Using COTS equipment helped reduced the overall program cost but posed some interesting challenges. There were numerous problems integrating modern equipment into systems designed over two decades ago. The upgrade centered on improving the microwave system to a three DS–3 capacity and replacing the communications switch

with a state-of-the-art remote control digital switch. With the communications backbone in place, many of the older radio's systems were replaced, and the new systems were integrated into a central control system, RMMS.

New radio upgrades include five new terminal communications interface HF antenna systems, 30 URC-200 UHF/VHF systems, nine FM base station/ repeaters, 54 FM mobile radios, and 63 PCS (personal communications service) hand-held radios. All radio assets were integrated into the newly installed Compunetix Contex 2000T digital switch, creating a sophisticated network of communication capability. In addition, a secure digital switch was also installed to accommodate the requirement of classified transmissions.

One of the more interesting products of this upgrade is a new underwater digital receiver system with a touch screen interface that replaced the old UQC (underwater telephone equipment) type receivers. The new digital receiver system, developed by Lockheed-Martin, takes the analog signal from the hydrophones and digitizes it. From there the signal is conditioned and noise is filtered out. The system then converts the digital signal to analog; it is then distributed to communication panels. PMRF is the first to implement this type of technology.

In addition to the increased communication capability, the security system had to be upgraded. The existing systems were evaluated and a design was created that used the existing equipment and augmented it with COTS systems. The final product was a 200-percent increase in video monitoring assets which, when combined with remote monitoring and control, provides the option of making many of the remote sites unmanned.

The CCN-II team is led by Lori Rodefer as project manager. Lead program managers are Wade Martin and Michael Batey. Project assistant is Dee Dee Olson.

"This small NRaD group brought CCN-II from a concept to a reality. Through hard work and team effort, CCN-II has been a success of which the Navy can be proud," Lori Rodefer said.

Intrusion Security System

System Upgrade Offers New Security at Townsend Range (SSC San Diego Outlook, vol. 20, no. 19, 3 Oct 1997)

An intrusion security system upgrade at the Savannah Combat Readiness Training Center, Townsend Range, was designed and implemented by the Air Surveillance and Ranges Branch, Code D335. Headed by Lori Rodefer, a base electronic system engineering plan (BESEP) was developed and the design approved. The Naval Air Systems Command Tactical Training Ranges Program Office (PMA-248) System Replacement and Modernization Program funded the new installations. Mike Batey, lead project engineer, was on-site as six cameras were installed and integrated. In addition, a modern security control panel and various motion and magnetic contact sensors were installed and networked to an auto-dialing alarm system.

The Townsend Range is located 50 miles south of Savannah, Georgia, and is open for viewing by the public at selected times. It is operated by the Georgia Air National Guard and used by all branches of the military.

Fighter pilots based on the East Coast average 8 to 10 training exercises daily that involve dropping inactive bombs, strafing, and laser bomb deployments. Surface-to-air missiles and electronic threat emitters set the stage as F–16, F–18, A–4, and other military aircraft identify their targets and shoot. The scoring is accomplished by a Weapons Impact Scoring System (WISS) and real-time information is relayed back to the pilots.

The intrusion security system upgrade meets the needs of the Townsend Range and allows for future growth and range expansion.

Sensate Liner Technology

Sensate Liner Technology May Save Lives (SSC San Diego Outlook, vol. 20, no. 20, 17 Oct 1997)

Future battlefield casualties may be reduced and medical triage improved by technology envisioned by Dr. Eric Lind, Materials Sensors and Systems Branch, Code D364. Battle casualty rates have not improved since the Civil War, according to Dr. Lind. New technology developed for the Sensate Liner for Personnel Monitor Applications project could enable medical personnel to save up to 70–80 percent of the seriously wounded. An injured soldier on the battlefield could be identified, located, diagnosed, and medics could have the correct medical help available before arriving on the battle scene.

Dr. Lind responded to a request from Richard Satava of the Defense Advanced Research Projects Agency (DARPA) for a sensate liner to augment his overall biomedical technology development program. Dr. Lind conceptualized a sensor suite capable of assessing biological damage and an associated wearable electro-optical circuit garment capable of mounting and collecting the information from this suite of sensors.

To develop and demonstrate the system, Dr. Lind put out a call for research and development proposals for the project to private industry and university laboratories. Research contracts were awarded to the Georgia Institute of Technology, Atlanta, Georgia; Mission Research Corporation, Fountain Valley, California; and ILC Dover, Frederica, Delaware. The work is jointly sponsored by the Defense Science Office of the Defense Advanced Research Projects Agency together with the Defense Logistics Agency.

The three contracted research facilities separately developed prototypes and demonstrated the basic sensate liner system functions defined by Dr. Lind. The resultant form-fitting garment can be mass produced using current textile technology for about $30.00 each. Comfort to the wearer was considered a design priority by each team. Interconnected sensing elements and devices feed their information to an electronics pack that contains a global positioning unit, a processor, and a spread-spectrum transmitter—similar to the Personnel Status Monitor (PSM) developed under DARPA funding by SARCOS Corporation.

The embedded biological and physical sensors monitor the medical condition of combat soldiers. When a soldier is wounded, the sensate liner tactilely detects and localizes the penetration, acoustically determines the wound (projectile)

track inside the body, and provides an accurate estimate of the biological damage (injury). The sensate liner optically detects bleeding, blood loss, and blood oxygenation. It electrically monitors the soldier's vital sign trends, i.e., blood pressure, pulse (heart rate), and respiration. The penetrating projectile can be classified as to caliber and kinetic energy (range estimate). Intra-sensor data fusion techniques assess the soldier's overall condition.

Marine Corps personnel contributed to the Sensate Liner for Personnel Monitor Applications project as did many SSC San Diego personnel, including Dr. Randall Moore, Head, Environmental Sciences Division (D36), and Ilya Stevens, head Materials, Sensors and Systems Branch (D364). Other participants from SSC San Diego were Joe Aboumrad, who acted as experimental specialist; Dr. Dale Barbour performed acoustic analysis; Dr. Carol Becker developed biological modeling; Dr. Roger Boss was responsible for transducer design; Hugh Copeland and Dr. Wayne McGinnis were involved in garment technology development; Dr. Bill McKnight performed systems integration; Susan Morales and Dr. Steve Cowen developed the fiber optics; Ross Myers developed the acoustic signal processing; Dr. Jack Dea performed data acquisition; and Gary Mastny developed the systems design.

The sensate liner potentially offers physiological monitoring to improve triage and battlefield medical intervention. In addition it has application to monitor law enforcement personnel, fighter pilots, and astronauts. It also has potential applications in medical monitoring of in and out patients; geriatric, intensive care patients, and infants; and many other dual-use civilian applications.

GPS Systems Development

GPS Team Completes Evaluation (SSC San Diego Outlook, vol. 20, no. 21, 31 Oct 1997)

The Global Positioning System Joint Program Office (GPS JPO), Los Angeles Air Force Base, created an evaluation team to select an antenna test infrastructure to meet current and future test needs. The team evaluated numerous test agencies to determine which facilities best met GPS JPO's requirements. They recently completed their evaluation and made recommendations to GPS that will ensure the GPS JPO is prepared to test all future antenna systems.

Team members included representatives from several aerospace corporations and Christina Wire, SSC San Diego, Code D313, GPS Systems Development Branch. Wire played a critical role in the evaluation process by providing input on technical issues associated with antenna testing and hosting numerous meetings.

CAPT Brian Knitt was the sponsor from GPS JPO in Los Angeles. CAPT Knitt is the antenna test manager for user equipment testing at GPS JPO. Wire said Knitt was highly committed and responsive to all teammates. He made sure that all the tasks were completed successfully by striving for clear open communications with everyone involved.

The project manager for this effort was CAPT Rebecca Gott, 746th Test Squadron. She led the team through the entire evaluation process, including a thorough review of proposals, test agency capability briefings, and site visits.

CARIBROC Upgrade Facility

CARIBROC Upgrade Facility Opens in Key West, Florida (SSC San Diego Outlook, vol. 20, no. 22, 14 Nov 1997)

The grand opening of the Caribbean Regional Operations Center (CARIBROC) Upgrade Facility in Key West, Florida was held on 9 October. The ceremony culminated over 10 years of planning, development, and installation activities. Key speaker at the ceremony was Deputy Commander-in-Chief, United States Southern Command, Rear Adm. Walter F. Doran.

CARIBROC conducts multi-sensor track and information processing and command and control operations within the Caribbean area of operations. This is in support of sensitive reconnaissance, contingency, and counter-drug operations to expedite the response of assigned reaction forces.

The upgrade program began in full swing in 1990 based on Required Operational Capabilities (ROC) 2–87. The Upgrade effort fused existing state-of-the-art technology in three major development areas: processing and display systems, communications systems, and radar systems.

The CARIBROC Branch, D333, was assigned as lead field activity and is now the in-service engineering activity for the CARIBROC upgrade systems. This code is headed by Jim Straus with technical support from Pat Ammons, Gary Alexander, Andy Gali, Lynn Gutierrez, Carolyn Luong, Colleen McCall, Mary Nguyen, Tuan Nguyen, Samir Othman, David Slade, Loi Troung, Nghia Vu, and Matthew Wuest.

They have successfully integrated and tested the individual systems developed by the prime contractors. D333 developed and implemented the system integration and implementation plan, the master test plan, and system test procedures. D333 developed and implemented a cut-over plan to ensure continuous uninterrupted operations during the transition from the existing to the upgraded facility. Other key areas of support involved independent verification and validation of prime development contractor activities, development of computer security accreditation documentation, and logistics and programmatic management.

D333 will continue to provide life-cycle support services in the Consolidated CARIBROC Support Facility (CCSF) located at the Old Town Campus. The CCSF encapsulates the software support activity, test beds, integrated logistics support, and systems engineering required to support the CARIBROC systems.

CARIBROC, originally called the Joint Air Reconnaissance Control Center (JARCC), was formed by direction of President John F. Kennedy in October 1962 to monitor reconnaissance missions during the Cuban Missile Crisis. CARIBROC's mission continued to evolve to include counter-drug detection and monitoring efforts in support of Joint Task Force Four's mission against illegal trafficking in the Caribbean transit zone.

With increased mission requirements, it became necessary to upgrade the outdated limited-capability systems. The Caribbean Basin Radar Network brought increasing numbers of sensors to an overloaded processing and display system.

Existing communications could not support the Caribbean area of operations and internal communications switching was inadequate. ROC 2–87 was developed and the upgrade program ensued. CARIBROC closed the 1980s providing reconnaissance support to Operation Just Cause in Panama. Contingency operations in the Caribbean increased in the 1990s with Operations Support Democracy and Uphold Democracy in Haiti; Able Vigil and the Cuban shoot down of two civilian aircraft in the Straits of Florida; and a resurgence of political sensitivity with the government of Cuba. On June 1 Commander in Chief, U.S. Atlantic Command shifted command of CARIBROC to Commander in Chief, U. S. Southern Command.

Technical Accomplishments

The accomplishments in this section are organized first by major mission/work areas, then alpabetically within those areas.

C4ISR

JWID '97

SSC San Diego participated in the Joint Warrior Interoperability Demonstration 1997 (JWID '97), the eighth in a series of demonstrations sponsored by the joint staff. The JWID theme of "Unity of Purpose" describes the demonstration of existing, new, and evolving technologies and methods designed to address real C4ISR issues in a joint and coalition environment. SSC San Diego's contributions to JWID '97 included the following:

SSC San Diego demonstrated the 3-D Volumetric Display, showing how Link–16 positional data could be spatially displayed to increase situational awareness for the warfighter.

A first for JWID was the involvement of submarines. The USS *Atlanta* (SSN 712) showcased 12 demonstrations geared to demonstrate technological solutions to interoperability issues between the submarine and the joint or coalition task force commander. SSC San Diego's involvement in the onboard demonstrations of Common Operational Modeling, Planning, and Simulation Strategy (COMPASS), Joint Maritime Communications Strategy (JMCOMS), Integrated Situational Awareness, and Sensor to Shooter were key to illustrating these solutions.

SSC San Diego provided valuable support to the JWID Multi-National Task Group. The group was a notional coalition task force that demonstrated enhanced coalition information exchange and improved C3 effectiveness and interoperability using ACP–123/X.400 (Allied Communications Publication) messaging between maritime forces from Australia, New Zealand, Canada, the United Kingdom, and the United States. This demonstration included evaluation of multi-cast messaging and message receipt during emission control.

Specific demonstrations with significant SSC San Diego involvement included: Modeling and Simulation to C4I in the Defense Information Infrastructure Common Operating Environment warfighting environment; Situational Awareness Beacon with Reply; Joint Maritime Communications Strategy Infrastructure; and Integrated Situational Awareness.

The Pilot Maritime Battle Center [now the C4ISR Systems Integration Environment (SIE)] provided support to the San Diego secondary sites and demonstrations. See "Large-Scale Integration Demonstrations" below.

ACDS Block 0

ACDS Block 0 Level 10 has been successfully installed in most CV/CVN (carriers) and LHD (multipurpose amphibious assault) class ships and in two LHA

(general-purpose amphibious assault) class ships. Block 0 Level 10 is also installed in the Atlantic Fleet Weapons Training Facility (AFWTF), Roosevelt Roads, PR; in the Pacific Missile Test Center (PMTC), Pt Mugu: and in the Pacific Missile Range Facility (PMRF), Barking Sands, HI.

ACDS Command Table

SSC San Diego continues to provide systems engineering improvements to the Advanced Combat Direction System (ACDS) Command Table. The ACDS Command Table offers several new capabilities, including modular design for ease in adapting to different configurations; embedded controls and displays to allow full view of the large-screen displays and color monitors; and a safe at each side wing for storage of classified watch instructions and documentation.

Large-Scale Integration Demonstrations

Recent large-scale integration demonstrations coordinated, all or in part, by C^{4}ISR Systems Integration Environment (SIE) have highlighted two of their key concepts: the coordination of integration assets throughout SPAWAR and the two-hub, lab-coordination concept.

Pilot MBC Phase 1 (JWID '97) Demonstration. The Pilot Maritime Battle Center [now the C^{4}ISR Systems Integration Environment (SIE)] provided support to the San Diego secondary sites and demonstrations. JWID '97 provided the maritime community the opportunity to demonstrate unity of purpose and the coordination of integration assets through the employment of the SIE. The C^{4}ISR SIE capitalized on JWID '97 as an opportunity to formally step through and evaluate the key processes associated with collaborative engineering and technology insertion in an integrated laboratory environment.

C^{4}ISR SIE Two-Hub Demonstration. Concurrent with a ribbon-cutting ceremony at SSC Charleston on 6 January 1998 for its new C^{4}ISR Engineering Center, SPAWAR successfully showcased its two-hub concept of lab coordination for the C^{4}ISR SIE. A variety of labs from San Diego and Charleston were involved but were interfaced through one central hub at each site. The SSC Charleston location serves as the East Coast Hub for the C^{4}ISR SIE. Dedicated circuits connect SSC Charleston C^{4}ISR SIE with the primary West Coast Hub at SSC San Diego. The two hubs significantly expand the C^{4}ISR SIE's capabilities and greatly enhance the C^{4}ISR SIE's ability to provide integrated C^{4}ISR systems to the Fleet.

Two major C^{4}ISR SIE objectives were demonstrated: (1) C^{4}ISR SIE collaborative engineering environment, supporting technology insertion/assimilation, architecture development, and system of systems integration and test, and (2) a reconfigurable C^{4}ISR SIE created from existing SPAWAR labs.

ACDS Peripheral Support Group

The ACDS Peripheral Support Group (PSG) system completed evaluation testing and achieved initial operating capability (IOC) as the shore-based and ship-borne replacement for many of the Navy's legacy peripheral systems. The PSG consists of two commercial off-the-shelf (COTS) hardware units, a

peripheral support unit, and a peripheral control station. It uses nondevelopmental item processor hardware, COTS operating systems, and utility software, and is intended to replace five Navy legacy electromechanical peripherals with small microprocessor-based, general-purpose hardware. It is relatively lightweight, reliable, and logistically supportable. The PSG uses AN/UYQ-70 hardware and software elements and incorporates UNIX-based, real-time operating system and commercial standard versa-module EuroCard architecture.

AN/SLQ-20B

The AN/SLQ-20B was approved to proceed to production by the Naval Air Systems Command on 27 February 1997. SSC San Diego is authorized to award the production contract for AN/SLQ-20B equipment for Aegis Destroyers. AN/SLQ-20B was developed and tested by SSC San Diego. Operational evaluation was completed onboard USS *John Paul Jones* (DDG 53) during October and November 1996. AN/SLQ-20B was determined to be operationally effective and suitable in January 1997.

CCARNET

Command and Control Advanced Research Network (CCARnet) assets and experience were used to link multiple SSC San Diego sites and to demonstrate SSC San Diego programs, highlighted by the Command Center of the Future, to VIPs at a central site. The scenario featured a warfighter operating in a collaborative environment supported by full-motion video teleconferencing over the SSC San Diego unclassified asynchronous transfer mode backbone.

CTAPS 5.2

SSC San Diego coordinated a joint acceptance test for the Contingency Theater Automated Planning System Version 5.2 (CTAPS 5.2) with the Air Force's 605 Test Squadron. Currently, CTAPS Version 5.1.3 is fielded worldwide to all services. The proposed upgrade to CTAPS 5.2 is a major stepping stone for the Navy as it is the first version to run on a Navy Tactically Advanced Computer platform. Once accepted, the CTAPS 5.2 system will be fielded worldwide. CTAPS was designed by the Air Force as an elaborate theater-level mission planning and execution system. It comprises applications and databases used to keep track of air assets and targets within a given region.

SSC San Diego is the single software support agency for CTAPS in the Navy and performs configuration management functions on all released software and documentation versions. For the past 5 years, SSC San Diego has supported the Navy by designing, testing, and fielding CTAPS systems for use in the Fleet.

CUB Version 2.2.3

The SSC San Diego Cryptologic Unified Build (CUB) team successfully completed testing of CUB Version 2.2.3 in preparation for release to the Fleet. CUB is the common software for cryptologic systems. The build is a library of cryptologic-specific products from JMCIS.

JMCIS Ashore/GCCS 2.1

The Joint Maritime Command Information System (JMCIS) Ashore was integrated with the Global Command and Control System Version 2.1 (GCCS 2.1) baseline and successfully passed Operational Test and Evaluation Force operational assessment. This capability permits simultaneous execution of UNIX-based GCCS and JMCIS Ashore applications on a common hardware local-area network configuration. The effort is a major milestone in bringing the Navy into the joint C^4I arena. This JMCIS Ashore software is in the process of being fielded at all Navy ashore command and control sites.

JMCIS '98

SSC San Diego was tasked to lead installation of JMCIS '98 in USS *Coronado*'s (AGF 11) Joint Battle Laboratory. JMCIS '98 is the new strategy for migrating JMCIS and other C^4I capabilities to the PC desktop environment. SSC San Diego will serve as the overall manager and technical direction agent for the upcoming prototype installation onboard *Coronado.*

Tandem Thrust '97

SSC San Diego provided support to the medical component of the combined U.S./Australian military training exercise called Tandem Thrust '97. The exercise involved more than 28,000 military personnel, 40 ships, and 250 aircraft.

SSC San Diego developed, fielded, and supported software for the C7F Surgeon. The software was designed to enter and track patients within the theater, record the medical condition of those patients, and track the operational status of the various medical treatment facilities involved in the exercise. The information technology provided by SSC San Diego proved to be of great value to the success of Tandem Thrust. The technology demonstrated that a minimum footprint, low administrative cost, user friendly, and command responsive system can be achieved.

SPAWAR O5L Logistic and Maintenance Support

SSC San Diego became firmly established as the Working Integrated Process Team (WIPT) co-leader for Acquisition Logistics Support. The Center led development and issuing of the C^4ISR and Information Technology for the 21st Century (IT-21) Supportability Plans, developed processes to identify how WIPT members and organizations were going to operate, assisted in development and marketing of the Intelligence Management Application Server/ Logistics Interactive Distributive Database System architecture, and established a major support "link" between SPAWAR O5L and O5F to improve support for system installation activities. The Center also established the Maritime Battle Center homepage, improved the 05L homepage, and initiated development of the 05L Training homepage. In addition, SSC San Diego was assigned as SPAWAR IT-21 training coordinator and tasked to integrate training requirements with the installation activities for C^4ISR/IT systems/equipment during the battle group/amphibious ready group inter-deployment training cycle. SSC San Diego has become a "Center of Excellence" for C^4ISR training, planning, and management and has also become the C^4ISR training integrator, consolidating and merging all C^4ISR training needs for each battle group.

COMPASS—Golden Nugget AwardfFor JWID '97

The Common Operational Modeling, Planning, and Simulation Strategy (COMPASS) project received the "Golden Nugget" award for JWID '97 demonstration, JW-023, "Modeling and Simulation (M&S) to Command, Control, Communications, Computers and Intelligence (C^4I) in the Defense Information Infrastructure Common Operating Environment."

The Pentagon uses the annual JWID series to uncover "golden nugget" technology that can quickly make the jump from concept or demonstration to use by active duty forces. Four JWID demonstrations, including COMPASS JW-023, were awarded a "Golden Nugget." The joint staff has now tasked the JWID '97 Joint Project Office to expedite plans for operational fielding of COMPASS services. See additional COMPASS accomplishments described in this section.

Transportable 3-D Display

SSC San Diego, with its industrial partners (Neos Tech, RGB Tech) achieved a major milestone with the successful installation and demonstration of a Transportable 3-D Volumetric Display System onboard the USS *John C. Stennis* (CVN 74) at Norfolk, Virginia, while participating in the Department of Defense's 1997 Joint Warrior Interoperability Demonstration (JWID '97). The 3-D Display was interfaced to the common operational picture data network and evaluated with live tactical data. The following comments were received after demonstrations to Department of Defense and industry representatives:

- From CAPT Dennis Murphy (Director of JWID '97) to SSC San Diego Commanding Officer CAPT Hal Williams: "3-D Volumetric Display a success at four-star level in JWID '97. ADM Geham (Vice CNO) was particularly impressed by the potential of this technology."
- From RADM Stephen Johnson to RADM George Wagner (Commander of SPAWAR). Comments on Navy's 3-D Display at JWID '97 related to the *Vincennes* shoot down of the Iranian Air Bus: "If the air picture had been displayed on a 3-D Display with the civilian traffic lanes marked on the display, they probably would never have considered it a threat and would probably never have fired. Similarly, if the *Stark* had had a 3-D display showing the inbound airplanes flying an attack profile, they might not have taken a hit."

AEM/S System

The Advanced Enclosed Mast/Sensor (AEM/S) System was installed on the USS *Radford* (DD 968), replacing the aft mast with an advanced composite enclosing structure. In preliminary tests, AEM/S demonstrated the capability to reduce or eliminate antenna blockage and false target echo problems associated with current metallic masts. It also shows potential for reducing mast preservation and maintenance costs by enclosing antennas inside the mast panel. The AEM/S is a key enabling technology for next-generation sensors and communications antennas. It will reduce life-cycle costs and pave the way for improvements to ship topside arrangement and design, and allow for incorporation of embedded sensor antennas and multifunction planar arrays.

COMPASS/JTFEX 97-1

COMPASS team members were recognized for outstanding support by official message 232350Z APR 97, PAC JTFEX 97-1 BRAVO ZULU, noting: "The exceptional support provided in planning the TBMD [theater ballistic missile defense] exercise scenario, equipment procurement, installation, and testing in the training and guidance to the JTF [Joint Task Force] and JFACC [Joint Forces Air Component Commander] staffs in the areas of modeling, simulation (M/S) and distributed collaborative planning (DCP) enabled the successful accomplishment of all TBMD exercise objectives."

COMPASS team members installed COMPASS-capable systems at six warfighter sites participating in Joint Task Force Exercise (JTFEX) 97-1 (Pacific): (1) USS *Coronado* (ACF 11); (2) USS *Constellation* (CV 64); (3) USS *Boxer* (LHD 4); (4) MCAS Yuma, Arizona; (5) NAS Fallon, Nevada; and (6) Ft. Bliss, Texas. Also, COMPASS-capable systems were used from four modeling and simulation sites: (1) SSC San Diego's M&S Operations Support Cell; (2) Space Warfare Center, Falcon, Colorado; (3) U.S. Army Chemical and Biological Defense Command, Aberdeen, Maryland; and (4) Defense Special Weapons Agency, Alexandria, Virginia. Team members supported these sites throughout the JTFEX 97-1 exercise.

COMPASS/Kernel Blitz '97 Exercise

The COMPASS team provided 2 weeks of support to warfighters on USS *Coronado* (AGF 11) and USS *Tarawa* (LHA 1) during Kernel Blitz '97 training exercise. The SSC San Diego Modeling & Simulation Operations Support Cell (MOSC) served as a focal point for providing support to these sites in their reachback to other modeling and simulation nodes and in briefbacks to warfighters. *Tarawa* naval message (022045Z JUL 97) to COMPHIBGRU THREE, stated: " . . . COMPASS provides a previously unavailable C^4I capability. COMPASS was used extensively and effectively for coordination of aircraft mission planning and information transfer. Extremely reliable. Marine personnel requested its future availability in CIC [Combat Information Center] with more numerous workstations."

Reconfigurable Antennas

SSC San Diego developed a new metal oxide semiconductor gate process that significantly reduces the parasitic coupling between individual antenna elements. This reduced coupling allows the antenna array to be used at higher frequencies without prohibitive losses. Operation above X-band is now possible.

RPOT

SSC San Diego has developed a new radio propagation assessment system that accounts for the combined effects of atmospheric ducting and terrain on radar and radio coverage. The Radio Propagation Over Terrain (RPOT) program combines the latest radio propagation models, atmospheric data from many sources, and the Digital Terrain Elevation Data maintained by the National Imagery and Mapping Agency.

RPOT has been distributed Fleet-wide and is also being used by the other Services. RPOT is now serving as the basis for the next-generation propagation assessment system known as the Advanced Refractive Effects Prediction System, which will replace the Integrated Refractive Effects Prediction System developed in the 1970s.

Satellite TADIL J

While in transit from Hawaii to West Coast homeports 7–12 November 1996, USS *Carl Vinson* (CVN 70) Task Group (TG) demonstrated reliable two-way real-time satellite tactical digital information link (TADIL) connectivity between S–TADIL J-equipped platforms over extended distances. Commander, Cruiser-Destroyer Group Three message P021610Z JAN 97 stated in part: "The C^2P [Command and Control Processor] combined with S–TADIL J effectively eliminates medium- and long-range connectivity holes, gaps, and propagation limits of traditional TADILS. This TG was provided with an unprecedented degree of TADIL connectivity resulting in a consistent tactical picture throughout the Force, greatly enhancing situational awareness. Continuous and robust link connectivity greatly decreased workload associated with tactical situation display management and maintenance on all platforms. Recommend S–TADIL J capability be added to operational C^2P software immediately and provided to all TGs."

ExInit

SSC San Diego and industry partner ATI created a 50,000-vehicle simulation scenario in less than 72 hours using the SSC San Diego-developed Exercise Initialization (ExInit) software tool. ExInit has been designed to permit the rapid generation of extremely large, doctrinally plausible, simulation scenario files with minimal user input. ExInit runs on a low-cost PC under the Windows NT operating system and can import real-world tactical doctrine and force-structure information to minimize the operator's training requirements.

ICESHELF–97

Iceshelf–97 was the 1997 field experiment for Project Spinnaker, a joint U.S./Canada effort to place a large-aperture acoustic monitoring array underneath the Arctic ice. The technology developed for this project has included:

- Longest known autonomous undersea vehicle self-navigated run to lay fiber-optic cable (160 km)
- World's longest unrepeated fiber-optic link (160 km, designed 210 k)
- First large-aperture Arctic Ocean shore-telemetry array
- Largest Arctic Ocean contiguous acoustic data set gathered
- Low-cost, lightweight, low-power array technology developed (generally applicable)
- (I–97) First demonstrated node replacement on a working array at site
- (I–97) First splice repair of a deployed fiber-optic telemetry cable

Autonomous Sensor Concepts Project

The High-Performance Computing Modernization Program approved funding for the Advanced Virtual Intelligence, Surveillance, and Reconnaissance (AdVISR) project. The effort will focus on the development and demonstration of high-fidelity sensor and communications models within the modular, extensible, reusable, distributed interactive simulation (DIS)-compatible environment of the AdVISR simulation system being developed by the Autonomous Sensor Concepts Project. ADVISR provides a physics-based DIS-compatible capability for evaluation of surveillance sensors, communications, data fusion, and command and control systems. The objective of the project is to demonstrate the value of high-performance computing to meet Navy advanced virtual, real-time simulation needs.

ISTEF Data Collection

The Innovative Science and Technology Experimentation Facility (ISTEF) successfully provided real-time laser imagery during the launch of the Space Shuttle (STS-81) to range safety personnel. ISTEF has been developing a laser imaging system to provide real-time night imagery of NASA's Cassini launch. Current range assets cannot see the launch vehicle during the critical portion of flight, the first 15 seconds, due to the bright plume. Imagery of the vehicle hardbody during the first 15 seconds would afford a margin of safety by allowing time to destroy the vehicle should problems occur.

Internetted Unattended Ground Sensors

SSC San Diego personnel completed a quick-look analysis for the Defense Advanced Research Projects Agency (DARPA). This was the first look at the performance of DARPA/SSC San Diego's main brassboard internetted unattended ground sensors: the acoustic sensor, the seismic sensor, the magnetic sensor, and the meteorological sensor. Field tests were performed in Yuma, Arizona, 21–25 July 1997 with 12 different types of time-critical targets. Further testing will follow algorithm enhancements based on this quick-look analysis.

Smartnet

Commander, Third Fleet message 211250z Feb 97, (Subject: PAC JTFEX [Joint Task Force Exercise] 97–1 NSS [Navy Strategic Studies] Bravo Zulu) cited SmartNet as follows: "The NSS Team, using SSC San Diego's SmartNet software, successfully demonstrated distributed heterogeneous computing across the SIPRNET [Secret Internet Protocol Network] using different computers at CINCPACFLT [Commander-in-Chief, Pacific Fleet] and the Maui High-Performance Computing Center (HPCC). Use of reachback high-performance computing resulted in NSS runs completed in minutes vice hours, enabling increased opportunity for the strike analysis."

Soldier 911

SSC San Diego personnel made important progress in installing and demonstrating the Soldier 911 system in South Korea. Soldier 911 is a geo-location, situational awareness and border alert system installed in U.S. Army UH–60

helicopters flying near the North–South Korean border. The system is used by U.S. Army soldiers on foot patrol near the Serbia–Macedonia border and in the joint security area (JSA) along the North–South Korean border.

The demonstrations in South Korea involved enroute navigation, border warning and position reportback. Soldier 911 ground-based systems are operational and operating at three remote sites. Two Soldier 911 computers are used at Air Traffic Control to monitor north and south sector traffic. The JSA ground-based Soldier 911 system was installed and is operational. Improved Global Positioning System wiring kits were installed in four 17th Aviation helicopters. Flexible ultrahigh frequency antennas were installed on the belly of all Soldier 911 helicopters. Four medical evacuation (MEDEVAC) helicopters were wired for the Soldier 911 system and three MEDEVAC Soldier 911 helicopter consoles are installed and operational.

TACINTEL II+

SSC San Diego's string of TACINTEL (Tactical Intelligence) II+ program successes continued with receipt of the OT (operational test)-IIA test report from Commander Operational Test and Evaluation Force (COMOPTEVFOR). TACINTEL II+ (Build 1) was determined to be both operationally effective and suitable. COMOPTEVFOR recommended Fleet introduction to the Chief of Naval Operations. The TACINTEL II+ program provides a simplified, easily upgraded, technologically advanced, secure, and highly flexible special intelligence communications system for supporting Navy operations.

URMTT

The Universal Radar Moving Target Transponder (URMTT) successfully demonstrated its ability to transpond realistic radar targets over the air against the 996 (frequency agile) air/surface search radar on the HMS *Westminster*, a United Kingdom frigate. Demonstration was made to representatives from seven North Atlantic Treaty Organization (NATO) countries that are members of the Fleet Operational Readiness Accuracy Check Sites (FORACS) Steering Committee. A hurricane off Cuba provided URMTT with a chance to demonstrate operation under challenging inclement weather conditions. This is a key advantage to URMTT—target drones and actual aircraft for radar targets normally would not operate under these conditions. In addition to the "any time and any weather" advantage, URMTT provides a substantial cost-avoidance advantage over drones and real aircraft.

Project DUNDEE

SSC San Diego participated in Project DUNDEE in FY 97, a joint program between the Ballistic Missile Defense Organization and the Australian Defence Science and Technology Organisation to investigate the use of high-frequency radar for theater ballistic missile (TBM) defense. We installed a portable high-frequency radar in Western Australia (WA) and successfully detected and tracked four TBMs launched from a site near Broome, WA. Based on the success of Project DUNDEE, the project has continued in FY 98 as DUNDEE II, for which SSC San Diego is the technical execution agent. Observations of TBM

launches from White Sands Missile Range will be carried out by the SSC San Diego portable high-frequency radar, and by the Wide Area Radar Facility, an over-the-horizon high-frequency radar located near Los Banos, CA. The results of both DUNDEE programs will be used to assess the application of the high-frequency surface wave radar to TBM defense.

Navigation

Global Positioning System (GPS)

SSC San Diego completed design and development on the Locator of GPS Interference, an electronic system that locates sources of interference that might be operating within the GPS frequency spectrum. The initial testing, which will lead to a flight demonstration, was begun. The Center completed laboratory testing and Functional Configuration Audit to begin production of the GPS VME Receiver Card. Also completed was Formal Qualification Testing for the command and control software, with delivery to the platform for flight testing in support of Developmental Testing.

Navigation Sensor System Interface (NAVSSI)

The NAVSSI system has been developed using an evolutionary acquisition strategy, whereby an initial capability is deployed promptly and then improved over time using software and hardware upgrades. During FY 97, the third major NAVSSI system release (Block 2) successfully completed its Operational Evaluation aboard the USS *Lincoln* (CVN 72), clearing the way for the deployment of this upgraded capability to the Navy. Work on Block 3, which will bring NAVSSI onto DDG-51 Class Destroyer, is under development. The use of commercial off-the-shelf hardware and government off-the-shelf software has enabled the Navy to deploy and maintain NAVSSI at a fraction of the cost that would have been associated with a traditional procurement.

Ocean Survey Program Survey System (OSPSS)

The United Kingdom Ocean Survey Vessel/Ocean Survey Program Survey System (UK OSV/OSPSS) was designed, developed, and installed aboard the U.K survey vessel, HMS *Scott*. The OSPSS was formally accepted and turned over to the U.K. Ministry of Defence. Completion of this major program milestone marked the conclusion of a vigorous 3-month dockside and at-sea technical evaluation and formal UKOSV/OSPSS acceptance testing conducted by SSC San Diego engineers and scientists. The HMS *Scott,* a new construction vessel, was designed and built specifically to support the SSC San Diego-developed and fully integrated survey system. The OSPSS collects navigation, bathymetry, and gravity data to produce high-accuracy bathymetric and gravimetric charts and other survey products. The HMS *Scott* is now considered the U.K.'s premier deep-ocean survey platform. SSC San Diego is conducting all necessary life-cycle support tasks required to ensure optimum shipboard survey system availability, performance, reliability, and maintainability.

Microelectronics

Integrated Circuits

SSC San Diego began technology transfer of an integrated circuit design to Hughes Aircraft Company. The integrated circuit was initially designed for SSC San Diego's ultra-thin silicon-on-sapphire 1.2–micron process and is being redesigned for fabrication at Hughes Newport Beach facility in their SOS3D process. The circuit is a prototype of a non-volatile memory chip using ferroelectric capacitors as the memory elements.

ONR Microelectronics Program

SSC San Diego, in cooperation with Lawrence Semiconductor, successfully deposited SiGe directly on sapphire. Transmission electron microscopy, Rutherford backscattering spectrometry, and X-ray analysis performed show single crystal material with 5% Ge content. This is the first known successful attempt to deposit this material on sapphire. This high-mobility semiconductor has future applications in silicon-based microelectronics for C^4ISR systems.

Wavelength Division Multiplexing Technology

SSC San Diego and SDL, Inc. have negotiated and signed a Cooperative Research and Development Agreement (CRADA), the "Wavelength Division Multiplexing Technology for U.S. Navy Fiber-optic Telemetry Systems." The objective of this CRADA is to further the development of advanced wavelength division multiplexing components and subsystems for applications to Navy and commercial sector high-bandwidth, fiber-optic-based systems. SDL intends to acquire the necessary SSC San Diego technology, via patent licenses, to commercialize the technology and market the devices. The patents of interest describe methods of producing fused-fiber wavelength division multiplexers with optical channel spacings less than 30 nanometers.

Fleet Support and In-Service Engineering

Coast Guard Support

SPAWAR Systems Activity Pacific provides engineering and communication support and services to the Coast Guard District 14 (Guam and Hawaii). In FY 97, major accomplishments included installing a turnkey digital microwave system that provides communications between Wahiawa and Lualualei, Hawaii, and conducting Electronic Systems Readiness tests on all District 14 Coast Guard cutters. The Activity also continued to provide engineering services for the National Distress System Modernization Project (NDSMP).

CTAPS

SSC San Diego completed Contingency Theater Automated Planning System (CTAPS) expansion/installation, including software load, on board USS *Blue*

Ridge (LCC 19). This installation added nine Sun Workstations to the six existing CTAPS workstations. A total of 23 drops were provided to support current and future needs. All workstations are tied to a new hub that will be connected to the ship's SHF Secret Internet Protocol Network pipe. SSC San Diego also completed activation of connection into the CTAPS network for Commander, Patrol Wing One /Commander Task Force-72 Headquarters at Kamiseya, Japan. Access to CTAPS will greatly improve CTF-72 capabilities for participation and response to tactical plan development and execution in support of Seventh Fleet operations.

Cryptographic Repair

The Cryptographic Repair Facility (CRF) analyzed and solved a long-term problem with KG–40 crypto key generators used throughout the Fleet. Requiring no special or additional parts, the fix can be done within 20 minutes. This repair procedure will affect and correct all KG–40 and KG–40A systems in the U.S. Navy and allied forces. In addition, a communications security equipment pool of ready-for-issue assets was established at the CRF, reducing fleet and shore customer turn-around time from several days to immediate exchange.

PMRF Communication Systems

SSC San Diego completed a major communications upgrade at the Pacific Missile Range Facility (PMRF), Barking Sands, Hawaii, under the Central Communications Network Upgrade program (CCN–II). PMRF provides major range services to facilitate training, tactics development, and evaluation for air, surface, and subsurface weapons systems for the Pacific Fleet, Department of Defense agencies, and foreign military joint exercises. PMRF is the world's largest multi-environment range that can support underwater, surface, air, and space operations. The CCN–II program will modernize the communications system at PMRF to meet new demands and support the Fleet.

UFL '97

SSC San Diego played a major support role during exercise Ulchi Focus Lens '97 (UFL '97) in Korea. SSC San Diego engineers installed and activated 12 circuits end-to-end throughout the Korean peninsula. After all circuits were activated, continued support was provided for the duration of the exercise to assist in network monitoring.

Mobile Detection Assessment Response System (MDARS)

SSC San Diego delivered the Multiple Robotic Host Architecture (MRHA) and coordinated the installation of an MDARS interior system for Early User Testing. The MDARS Interior program completed Milestone II and entered Engineering Manufacturing Development (EMD) for the interior robot and control system. SSC San Diego will maintain the MRHA software during EMD and transition it to the system contractor.

SATCOM Foreign Military Sales

Engineering analysis and design support to countries including Japan, France, Germany, and Great Britain enabled installations of upgrades and modifications

to 5-kHz systems, some of which represented joint service support endeavors. Design and construction services were provided in support of the French depot repair facility for UHF SATCOM and a separate maintenance station for use onboard the French aircraft carrier *Charles De Gaulle*. New Zealand was provided extensive logistics support in its attempt to find a lightweight antenna system for *Canterbury* class ships.

Systems Engineering

SSC San Diego developed a communications architecture for the Hunter Warrior exercise to provide ship-to-disembarked Marine Corps forces communications using standard Navy and Marine Corps equipment strings. Demonstrated asynchronous transfer mode communications capability over Navy/Marine Corps line-of-sight and SATCOM communications links.

ADNS

SSC San Diego completed installation and System Operational Verification Test for all ships in the *Lincoln* Battle Group, the first Battle Group to have the Automated Digital Network System (ADNS) installation completed prior to the Technology Completion Date. Conducted testing of ADNS over 5-KHz onboard USS *Shiloh* (CG 67), USS *Valley Forge* (CG 50), USS *Elliot* (DD 967), and USS *Jarrett* (FFG 33), the first time Internet Protocol traffic has been sent over a 5-KHz channel from a U.S. Navy vessel.

BLII

In support of the Base Level Information Infrastructure (BLII) Program for the Defense Information Infrastructure Common Operating Environment, the engineering plans were completed for implementation of Base Area Networks in the Pacific Northwest (six bases) and Pacific Southwest (five bases), which included gathering of infrastructure data for over 200 commands/activities. In addition, pierside connectivity for the USS *Coronado* (AGF 11) at SUBASE San Diego was designed and installed.

TESS

SSC San Diego designed, produced, and fielded the Tactical Environmental Support System (TESS) Next Century Transition (NCT) that replaced existing proprietary UNIX-based hardware and a monolithic software build. TESS NCT underwent and successfully passed Follow-On Test and Evaluation in December 1997 with the following comments: "TESS NCT demonstrated significant increases in processing capability, data storage capacity, and software functionality over the basic TESS system. The capability to access the Secret Internet Protocol Network was a major enhancement. The Windows NT operating environment greatly improved operator ease-of-use and human–machine interface." Praise also came from the Oceanographer of the Navy, RADM Paul Tobin, in a formal naval message stating: "...your aggressive timeline moved rapidly from preliminary system design, to prototype deployment, to successful operational evaluation, to fielding. The sustained diligent work of SPAWAR/SSC San Diego and developer personnel since February 1997 put powerful new PC-based

Information Technology for the 21st Century (IT-21) compatible functionality and connectivity directly in the hands of the fleet forecasters."

Link-16 In-Service Engineering Agent

SSC San Diego provided technical assistance and training to the USS *George Washington* (CVN 73) and USS *Nimitz* (CVN 68) battle groups to ensure Link-16 functionality and interoperability while deployed in the Arabian Gulf. As part of the assistance, Joint Tactical Information Distribution System (JTIDS) Network Library (JNL) 28 was developed and hand carried to both battle groups. JNL 28 was created to provide the options required for two battle groups operating on a common Link-16 network.

RADIAC Calibration

SSC San Diego established an equipment repair/calibration workload with SPAWAR foreign military sales to provide RADIAC units for foreign governments, shipped equipment to Australia, and will be shipping a large quantity to Saudi Arabia. The Center is the first Navy RADIAC lab to provide services to non-US customers and the only RADIAC Calibration Laboratory on the West Coast. Due to workload increases, a new RADIAC laboratory was established at Battery Ashburn South. The new RADIAC facility mission is testing, calibration, and repair of distributed radiation detection equipment for the U.S. Navy.

Marine Mammals

Mine Countermeasures (MCM)

The Mk 4 and Mk 7 systems participated in Kernel Blitz 97 and Joint Task Force (JTF) EX 97 Fleet Exercises. The Mk 4 MMS is a tethered mine hunting system and the Mk 7 MMS is a bottom mine hunting system that provides the only buried mine detection in the Fleet. SSC San Diego also successfully completed the feasibility demonstration of a new MCM MMS that will operate in very shallow water. The EX 8 MMS will be developed as an ACAT IVT starting in FY 98.

MMATS

SSC San Diego personnel completed the final on-site data collection phase of the northern right whale mitigation exercise. In addition to the 13 acoustic sightings made using the Marine Mammal Acoustic Tracking System (MMATS), a significant collection of infrared sightings were made in the area using an AN/KAS-1A infrared detection system.

Independent Research

Broadband Fiber Source Power and Spectrum Dependence on Reflectance and Filter Properties

This project investigated rare-earth doped optical fiber light sources. A goal of the project was to devise novel methods to improve performance. Optical fiber

sources are the most promising light source for interferometric fiber-optic gyroscopes (IFOGs). Because of high sensitivity, physical robustness, and potential low cost, IFOGs are a leading candidate for next-generation tactical- and navigation-grade gyroscopes for a wide variety of military and civilian systems.

A key component for IFOGs is the optical source. Requirements for the optical source are high-power, wide spectrum, wavelength stability, low cost, and small size. Rare-earth doped optical fiber amplified spontaneous emission (ASE) sources are the most promising technology to achieve these requirements. However, a current limitation of ASE sources is inadequate wavelength stability, particularly as affected by temperature. The instability results primarily from gain competition between emission wavelength peaks, and can be substantially mitigated by implementation of an optical filter in the ASE source. The project successfully demonstrated a simple, potentially low cost, optical filter based on fused fiber coupler technology.

The project was incorporated into an ongoing Defense Advanced Research Projects Agency (DARPA) sponsored Manufacturing Technology (MANTECH) program for IFOGs.

Constant Envelope Modulation Techniques for UHF SATCOM

This project investigated modulation techniques resistant to signal distortion caused by nonlinear amplifiers and communication channel effects. The project successfully identified and developed novel combinations of pulse shape and code modulation that are highly resistant to the nonlinearities occurring in ultra-high-frequency satellite communication (UHF SATCOM) systems, thereby enabling a large increase in data rate capabilities. Project results were incorporated into a program sponsored by SPAWAR to develop standards for medium-data-rate UHF SATCOM systems.

Modulation and waveform standards resulting from this project will also be integrated into a new SPAWAR Digital Modular Radio system as an option in FY 99. In addition, there is great interest in the improved modulation methods by many Navy groups (including participants in the Information Technology for the 21st Century [IT-21] effort) seeking to achieve increased data rates to surface and subsurface combatants via acoustic as well as electromagnetic communication systems.

Faster-than-Real-Time Synthetic Forces Simulation

This project investigated software architectures for realistic computer simulation of military forces at very high speed. The goal was to achieve simulation speeds that exceed real-time simulation (i.e., simulation time equal to physical time). This process is referred to as faster-than real-time simulation (e.g., execution of 2 days of simulation time within a period of several hours.)

The project identified two software architectures and a single software abstraction layer that achieve the desired goal of faster-than-real-time simulation of realistic military forces and equipment. This objective was accomplished at both the electronic circuit level for military equipment and the theater level for military forces. These capabilities have been demonstrated and accepted for transition into fleet programs.

Stochastic Resonance Detectors

This project investigated novel signal detection methods in Superconducting Quantum Interference Devices (SQUIDs) based on the phenomenon of stochastic resonance. A principal goal of this effort was to develop SQUID detectors that would be robust in the presence of high levels of background noise.

Although conventional SQUID magnetic detectors are highly sensitive, they have characteristics that severely limit their applications. One limitation is that conventional superconductors require expensive cryogenic cooling apparatus, and a second limitation is that the "slew" rate, or ability to respond to rapidly varying fields, is restricted by the feedback system employed in radio frequency modulated SQUIDs. Both of these limitations can potentially be circumvented by development of novel detection methods that exploit stochastic resonance phenomena. A noise-robust SQUID could use high-temperature superconductors to alleviate the expense of cryogenic cooling. In addition, a noise-robust system could be used outside the shielded environments in which laboratory SQUID detectors are normally employed.

The project successfully developed a SQUID detection scheme that shifts the detection of a low-frequency magnetic signal out of the $1/f$ noise regime, while maintaining high-slew-rate capability. This accomplishment has enabled the project to transition to exploratory commercial development under a Naval Air Systems Command (NAVAIR) sponsored Phase II Small Business Innovation Research (SBIR) program with Quantum Magnetics, Inc.

Appendix A
Achievement Awards

1997 Achievement Awards

GENERAL AWARDS

Presidential Rank Award for Senior Executive Service

Richard Shearer

Vice President's Hammer Award (for reinventing government)

Tactical Advanced Computer team for establishing innovaitve purchasing procedures for commercial off-the shelf information technology for Navy, Marine Corps, Coast Guard, and other DoD activities

Larry Core	Mike Premi
LCDR David Reidy	Thomas Adams
David Berry	Kay Sowers

Gabriel Haduch, Navy representative of tri-service Electronic Bid Set Working Group, which replaced current printed media reproductions of construction contract bid documents with electronic alternatives such as compact disks

Fellowship in Acoustical Society of America

Dr. Sam Ridgway for research on marine mammal acoustics

IEEE Oceanic Engineering Society Distinguished Technical Achievement Award

Dr. Newell Booth

The Technical Cooperation Program Award

Ceasar Castro for applying Global Grid technology to improve versatility of military communications systems within TTCP nations

Undersecretary of Defense (Acquisition and Technology) Certificate of Appreciation

Ron Bell, leader of Combat Survivor Evader Locator team

NAVY AWARDS

VADM Harold G. Bowen Award for Patented Inventions

Bob Anderson of NUWC Arctic Submarine Lab and retirees Rod McLennan and Bob Vachon for invention of an under-ice collision avoidance sonar, developed in 1970s and 1980s while they were employees of NRaD predecessors Naval Undersea Center and Naval Ocean Systems Center

Chief of Naval Research Dr. Arthur E. Bisson Prize for Naval Technology

Sandra Wetzel-Smith for development of the Interactive Multisensor Analysis Trainer concept for ASW training

NAVY SUPERIOR CIVILIAN SERVICE AWARDS

Martin Jordan from Commander, Seventh Fleet, for service as NSAP Science Advisor

Peter Labbe from U.S. Naval Forces Central Command, U.S. Fifth Fleet, for service as lead engineer for an intelligence and tactical command and control systems upgrade in Bahrain

Jim Price from Deputy Commander-in-Chief, U.S. Navy Forces Europe, for service as NASP science advisor

Russell Vorce from the Office of Naval Research for providing technical guidance to all Naval Science Assistance Program Science and Technical Advisors in Pacific and Asian joint Naval and Marine Corps Commands

Neil Weinstein from Commander, Third Fleet, for service as NSAP field representative

NAVY MERITORIOUS CIVILIAN SERVICE AWARDS

Sabine Apitz for expertise in contaminated sediment issues to support environmental remediation

Edward Baxter for management of the Waterside Security System Program, resulting in improved security for the Ballistic Missile Submarine bases in Georgia and Washington

Ronald Bell for developing technology for remote Global Positioning System-based devices for position tracking and reporting

David Bly for financial expertise on the Navy Working Capital Fund and in the preparation of the command's annual A–11 budget

Karl Cain for guiding development of the Digital Modular Radio segment of the Joint Maritime Communications Strategy into a reliable architecture

John Chevrier for leadership of the systems engineering team for the U.S. Atlantic Command's Joint Training, Analysis and Simulation Center, resulting in a world-class technology and training facility

Alexander Crane for oversight of Circuit Mayflower programs within his branch and for spearheading the effort to replace the Omega navigation system using fixed very low frequency transmitters

Dr. Graham Garcia for leadership at the Integrated Circuit Research and Fabrication Facility, the sole silicon integrated circuit design, fabrication and testing capability for all the military services

Patrick Garcia for service as project manager and lead systems engineer for the Joint Maritime Command Information System, providing state-of-the-art command and control technology to the Fleet

Charles Golden for developing a new approach to testing Global Positioning System anti-jam performance and for innovation in acquisition contracting

Richard Heckman for development and revision of financial and administrative practices to ensure compliance during merger of his department into the command

Francis Ho for leadership in providing state-of-the-art communications technology and in designing major national and international communications facilities

Edward Jahn for service as manager of the Deployable Autonomous Distributed Surveillance project

Robert James for development, engineering, fielding and operational support of the Soldier 911 communications system in Korea and Macedonia

Michael Kono for system engineering on the Joint Maritime Command Information System Ashore, providing state-of-the-art technology to development and reengineering of a large-scale C^4I system

Albert Legaspi for managing the Tectical Intelligence II+ program

David Lowenstein for development of several command, control, communications and intelligence prototypes which serve the joint intelligence community.

Ronald Major for overseeing and directing a number of antenna and microwave component research and development projects

Edward McDaid for expertise resulting in development of a unified classification methodology for active surveillance sonar

Sharon Milstead for improving performance of the Tactical Related Applications Data Dissemination System

Dennis Rozanski for leading unique government acquisition effort using Federal Express premium service, resulting in dramatic (75–90%) reduction in logistics cycle time and $12 million savings on spare parts inventory

Barry Siegal for leadership of advanced software development for Naval Personnel Research and Development Center, the Office of Naval Research and NATO

Harold L. Smith for leadership in moving the command into the intelligence, surveillance and reconnaissance technology development areas

Ralph Smith for coordinating the Command and Control Department's architecture and engineering business area, and for assistance in the transition of Space and Naval Warfare Systems Command employees to San Diego

Ilya Stevens for developing a new biotechnology product line for the Materials, Sensors and Systems Brach which had lost its business base

Mark Stevenson for program management and scientific leadership for acoustics and ocean surveillance projects such as Project Spinnaker and the Autonomous Buoyed Environmental Sensor System

Charles Suggs for project engineering on the assault ship Advanced Combat Direction System upgrade program

NAVY AWARD OF MERIT FOR GROUP ACHIEVEMENT

Broad Area Announcement Streamlining Team

G.E. Brown
Melissa Cleland
Rick Esaias
Jack Faulkner
Charmaine Joworski
Eleanor Kerbs
Neil Krost
Susan Kuramoto
Dan Lumpkins
Carol Mallow
Michele Marshall
Todd McKamey
Maria Papet
Sharon Pritchard
Sabrina Sabedra

Common Operational Modeling, Planning, And Simulation Strategy program

Jim Babcock
Ken Faucher
Sonia Feiler
Joy Green
Wes Lee
Robert Leone
Gary McCown
Debbie Nienow–Smith
Nick Nayfack
John Novotny
Paul Payne
Cheryl Putnam
Joe Reyna

Expedited Delivery Order Process (EDOP) and Beyond EDOP

Tim Dowd
Faye Esaias
Rick Esaias
James Garrett
Bonney Johnson
Charmaine Joworski
Neill Krost
Susan Kuramoto
Dan Lumpkins
Carol Mallow
Michele Marshall
Todd McKamey
George Peterson

Financial Document Cleanup Team

Loretta Austin
Virginia Cade
David Umbenhower
Patsy Dworshak
Rosalie Espiritu
Rhea Koncz
Barb Leetch
Kathleen Mancuso
Yvette McCamant
Sandy Stanten
Rachel Stillwagon

Hayfield Muli-Chip Module (revolutionary crypto chip)

Eric Cartagena
Anastasia Dimitriu
John Harden
Ella Hughes
Dennis Hurst
Hugo Jazo
Genia Kyres
Joseph Loughlin
Bieu Lu
Elizabeth Machado
Larry Martin
Galard Mills
Pat Reaves
Charles Rhea
Patrick Sullivan
Jerome Symanski
Karl Wilhelm

Oral Presentations

Rick Esaias
Trelli Davis
Charmaine Joworski
Carol Mallow
Jeff Mansfield
Todd McKamey
George Peterson
Kenneth Simonsen

MERITORIOUS UNIT COMMENDATION

For support of completion of 27 major ship availabilities, including a first-of-a-kind refueling overhall of the USS *Los Angeles* (SSN–688) while the Mare Island Naval Shipyard was under closure order:

Scott Browne
Terry Clark
David Hayashi
Michael Lee
Sam Milligan

For managing acquisition of submarine communications systems and equipment during a period of shifting mission requirements and political realities:

80 personnel of Submarine Communications and Command, Control, Communications, Computers and Intelligence Systems Division

NCCOSC AWARDS

NCCOSC INITIATIVE AWARDS

Christopher Hansen
Carl Reeves

NCCOSC COMMANDER'S TEAMING AWARDS

For handling all SPAWAR claimancy-wide C^4I installations:

John Bentley
LT Kevin Peterson
James Rodenkirch
Susan Senese
Glenn Yee

For service on the USACOM Joint Training, Analysis, and Simulation Center system engineering team:

Susan Anderson
John Chevrier
Gregory Knapp
Laura Knight
Claude Norton
John Salzmann
Ann Todd

For service on the Theodore Roosevelt Battle Group Advanced Digital Network System (ADNS) team:

Terri Alexander
Sandra Bentley
Kenneth Casey
LT Jerry Dismuke
Debra Gookin
David Guitas
Thomas Ogden
James Rhode
John Wilson

NRaD AWARDS

LAURITSEN-BENNETT AWARDS

Jeff Grossman—Excellence in Science for his leadership in application of human factors research and technology devleopment to improve the effectiveness of complex naval systems. Honored for his vision in development of the Command Center of the Future, and for personal contributions to and leadership of efforts such as Tactical Decision Making Under Stress (TADMUS) and the Command and Control Warfare Commander's segment of the Joint Maritime Command Information System (JMCIS).

Tom Knight—Excellence in Engineering for his very effective efforts in transitioning virtually every project from concept into operational use. Particularly cited was his leadership of the Tactical Receive Equipment (TRE) program, which revolutionized the way the intelligence community does collection, processing and reporting of tactical information. He was cited as well for development of the TRE Related Applications (TRAP) Data Dessimination System (TDDS).

Don Lydy—Excellence in Staff/Support for his initiation of the Base Exterior Architecture Program to set consistent architectural design standards for the command and for his environmental leadership, which led to establishment of the Point Loma Ecological Reserve. He was previously cited as the Outstanding Natural Resource Manager of the Year by the Chief of Naval Operations and the Secretary of the Interior.

EXEMPLARY ACHIEVEMENT AWARDS

Alfred Aburto
Edgar Alburo
Carrie Alexander
Don Alkema
John Barnett
Raymond Barrera
Michael Batey
Alton Bennett
Mark Berry
Judith Boland
Craig Brown
Linda Brady
Dale Bryan
Lawrence Carr
Jon Cherry
John Chhit
Brian Colvin
Marlen Conklin
Billie Coon
Dennis Cottel
Michael Crowley
Jerome Dejaco
Gaylord Doerck
Colleen Dorin
Judy Duenas
Lorraine Duffy
John Durfee
Gary Evans
Gloria Galvan
Mark Ganzer
Maryann Garbarini
Daniel Garcia
Antonio Guevara
David Guitas
Diana Griffin
Karen Haines
Gregory Hama
Susie Hartzog
Tracy Heath-Pastore
Thomas Hepner
Genevieve Hernandez
James Hodson
Yau Keung Hom
Chari Hoover
Glawanda Jernigan
Brian Johnston
Thelma Jones
Joan Kaina
John Kmet
David Knowles
Rymond Koshi
Robin Laird
Brian Landers
Martin Leblang
Salvador Ledesma
Darrell Lee
Wayne Leibitzke
Gabriel Lengua
Cris Lisica
James Logan
Michael Lovern
Mavis Machniak
Myron MacNeil
Roy McConnaughey
Athanison Monroe
Jeffrey Morrison
Charles Moussa
Geng Moy
Nancy Nakamura
Mark Nguyen
Wanda Nishida
Bruce Offord
Ronald O'Rourke
Joseph Osa
Allan Oster
Richard Paller
James Parsons
Lisa Pinck
Herbert Poindexter
Karen Prenger
John Quintana
Holly Raley
Barry Randall
Lee Rogers
Catherine Ruiz
George Ruptier
Craig Sayre
Randall Scott
Art Senhen
Gregory Settlemayer
Cynthia Sherwood
Allen Shum
Hale Simonds
Sandra Stanten
Gary Steinweg
Craig Stroing
Chen-Ko Sun
George Sweeney
Linda Swinney
Daniel Tam
Steven Timmer
Frank Tirpak
Alan Umeda
Renton Valledor
Darrell Van Camp
Marian Varela
Toan Vuong
Linda Walker
Delores Washburn
Abby Westerman
Eric Whitesell
Richard Worthen

SECRETARIAL AWARDS

Susan Allen
Jackie Loomer
Paula Murset

PUBLICATIONS AWARDS

Publications of the Year

Nancy Campbell
Dr. Robert Dinger
Jeff Grovhoug
Dr. Douglas Jensen
Roger Keating
Bill Nugent
Michael Pollock
Roger Rysdyk
Richard Schindler
Herbert Schmidt
Peter Seligman
Dr. David Stein
Dr. Thomas Tice

Distinguished Publications

Dr. Donald Albares
David Brock
David Chadwick
Dr. Paul de la Houssaye
Wadad Dubbelday
Stephen Hart
Dr. Jeff Ho
George Imthurn
Don Lydy
Ronald Major
Dr. Ken Richter
Rockie Ricks
James Rohr
Dr. Stephen Russell
Jon Schoonmaker
Dr. Randy Shimabukuro
Dr. David Stein
Robert Welch

Awards of Excellence

William Bradley
Dr. Adi Bulsara
Steven Dunham
Dr. Peder Hansen
Herb Hitney
Mark Hogue
Mario Inchiosa
Dr. Stephen Lieberman
Anthony Marino
Bernard Shostack

Awards of Merit

Dr. Newell Booth
Dr. Marion Ceruti
Ron Falldorf
Dr. Irwin Goodman
Tom Hampton
Lance Koyama
Shing Li
Dr. Stephen Lieberman
Patrick Moore
Richard Orazi
Stephen Pappert
Philip Schey
Eric Von Colln

SAFETY AND ENVIRONMENTAL AWARD (first)

Site Characterization and Analysis Penetrometer System team

Tom Hampton
Dr. Stephen Lieberman
Dr. David Knowles
John Andrews
Dr. Pamela Boss
Greg Theriault
Shaon Miller
Robert Cook
James Melega
Leon Smith
Billy King
Leonard Martini

Individual Safety and Environmental Awards

Celia Metz
Jim Richards

45-Year Service Award—James Coats

40-year service awards—Wes Andrew, Leon Bush, Rudy Hermosura, Bradford Humphrey, Al Jensen, Robert Johnson, John Maynard, Ric Millen, Elvin Roeske, Frank Shipp, Richard Spies, Russ Vorce, Norman Wada, Ron Webster

MILITARY AWARDS

Good Conduct Awards

Electronic Warfare Technician (Surface Warfare) First Class Merrell Browning (4th Award)

Chief Boatswain's Mate Michael Kindred (3rd Award)

Operations Specialist First Class Gary Wooldridge (3rd Award)

Aviation Storekeeper Second Class Timothy Lankford (2nd award)

COMMUNITY SERVICE AWARDS

John Hammond
Terry Sampite

Appendix B
Patents

PATENT AWARDS—CY 97

Inventor(s)	Title	Patent No.	Date
Cowen, Steven J. Dombrowski, James H.	Fiber Optic Cable Splice and Method for Producing Same	5,592,579	07 Jan 97
Cowen, Steven J. Young, Christopher M. Dombrowski, James H. Kono, Michael E. Daughtry, James H.	Process for Manufacturing a Fiber Reinforced Optic Microcable with a UV Cured Resin	5,593,736	14 Jan 97
Clavell, Cesar, Jr.	Apparatus for Measuring Lead Content of Water	5,595,635	21 Jan 97
Abramo, Robert S.	High-Power Broadband Antenna	5,600,335	04 Feb 97
Ho Thinh Q. Rockway, John W.	Wideband Omni-Directional Antenna	5,600,340	04 Feb 97
Bendall, Charles S.	Liquid Crystal Interferometer	5,600,440	04 Feb 97
Aklufi, Monti E.	Ion Implantation Buried Gate Insulator Field Effect Transistor	5,602,403	11 Feb 97
Edelblute, David J.	Method and Apparatus for Spectrum Analysis by Complex Cumulants	5,602,751	11 Feb 97
Shoemaker, Patrick A.	Non-Volatile, Bidirectional, Electrically Programmable Integrated Memory Element Implemented Using Double Polysilicon	5,617,352	01 Apr 97
Bond, James W.	Narrowband Signal Revealer	5,631,877	20 May 97
Aklufi, Monti E.	Low Temperature Plasma Film Deposition Using Dielectric Chamber as Source Material	5,635,144	03 Jun 97
Tash, Harvey Reed, Robert C.	Method and System for Regenerating Amplitude and Timing Characteristics of an Analog Signal	5,636,248	03 Jun 97
Cowen, Steven J. Young, Christopher M. Dombrowski, James H.	Fiber Optic Microcable Produced with Radiation Cured Composite	5,636,307	03 Jun 97
Bullat, David M. Tang, Po-Yun	Fiber Optic Self-Multiplexing Amplified Ring Transducer and Force Transfer Sensor with Pressure Compensation	5,637,865	10 Jun 97

PATENT AWARDS—CY 97 (Continued)

Inventor(s)	Title	Patent No.	Date
Cartagena, Eric N. Walker, Howard W.	Method for Fabricating Complementary Vertical Bipolar Junction Transistors in Silicon-On-Sapphire	5,641,691	24 Jun 97
Kennedy, Paul G. Stevenson, Willard	Fiberoptic Cable Junction	5,642,451	24 Jun 97
McCool, John M.	Pulse Coded Sonar Having Improved Doppler Determination Feature	5,648,940	15 Jul 97
Orazi, Richard J.	Method for Tuning Fiber Optic Couplers and Multiplexers	5,652,819	29 Jul 97
Kevorkian, Aram K.	Method and Apparatus for Preprocessing Inputs to Parallel Architecture Computers	5,655,137	05 Aug 97
Laird, Robin T. Gilbreath, Gary A. Everett, Hobart R.	System for Assigning Computer Resources to Control Multiple Computer Directed Devices	5,659,779	19 Aug 97
Dubbelday, Wadad B. Shimabukuro, Randy L. Russell, Stephen D.	Electroluminescent Device in Silicon on Sapphire	5,661,313	26 Aug 97
Sutton, Paul W.	Acoustic Communication System	5,661,699	26 Aug 97
Olson, Jack R. Stevenson, J. Mark Sotirin, Barbara J.	Buoyed Sensor Array Communications System	5,663,927	02 Sep 97
Johnson, Leopold J. Hammond, Russell E.	Dielectric Transformer	5,666,047	09 Sep 97
Pugh, Jamie K.	Automatic Medical Sign Monitor	5,671,734	30 Sep 97
Hansen, Peder M.	Rosette-Shaped Monopole Antenna Top-Load for Increased Antenna Voltage and Power Capability	5,673,055	30 Sep 97
Miller, Howard A.	Sock Shaped Internal Strength Member for Towed Arrays	5,673,235	30 Sep 97
Scheps, Richard	ER:YALO Upconversion Laser	5,682,397	28 Oct 97
Kasa, Shannon D. Shimabukuro, Randy L. Dubbelday, Wadad B. Gookin, Debra M.	Optical RF Bandpass Filter and Method for Manufacturing Same	5,687,263	11 Nov 97

PATENT AWARDS—CY 97 (Continued)

Inventor(s)	Title	Patent No.	Date
Sexton, Douglas A. Russell Stephen D. Reedy, Ronald E. Kelley, Eugene P.	Excimer Laser Dopant Activation of Backside Illuminated CCDs	5,688,715	18 Nov 97
Stein, David W. J.	Method for Detecting Signals in Non-Gaussian Background Clutter	5,694,342	02 Dec 97
Schlosser, Thomas W. Cain, Karl J. Evanoff, George A.	Self-Adjusting Statistical Noise Analyzer with Interference Suppression	5,696,691	09 Dec 97
Anderson, Kenneth D.	Method for Remotely Detecting Tides and the Height of Other Surfaces	5,703,594	30 Dec 97

Appendix C
Distinguished Visitors

JANUARY

7–8 Major General Edward Hanlon, USMC
Director for Expeditionary Warfare (N85)
Office of the Chief of Naval Operations

7–9 Dr. Susan Bales
Director
Naval Science Assistance Program
Office of Naval Research

21 Rear Admiral Richard Naughton, USN
Director
Plans and Policy (TCJ5)
U.S. Transportation Command

21–24 Dr. Marv Langston
Deputy Assistant Secretary for C^4I/Space and
Electronic Warfare/Chief Information Officer
Office of the Secretary of the Navy

22 Vice Admiral William Hancock, USN
Director
Office of Budget/Fiscal Management Division (N82)
Office of the Chief of Naval Operations

24 Brigadier General Stephen N. Xenakis, USA
Commanding General
Dwight David Eisenhower Army Medical Center/
Commanding General
Southeast Regional Medical Command/
Lead Agent
TRICARE Health Services Region 3

27 Admiral James R. Hogg, USN (Ret.)
Director
Strategic Studies Group
Office of the Chief of Naval Operations

FEBRUARY

4 Rear Admiral Russell D. Moore, CCM, CD
Commander
Maritime Forces, Pacific
Canada

10 Rear Admiral Richard Williams, III, USN
Deputy Director
Expeditionary Warfare Division (N85)
Office of the Chief of Naval Operations

10–14 Mr. John W. DeSalme
Program Executive Officer
Space, Communications and Sensors
Space and Naval Warfare Systems Command
Brigadier General Valtero Pomponi
Chief
State Maggiore Aeronautica Vi Reparto
Italy

12 Mr. Charles Valentine Betts
Deputy Controller of the Navy/
Director General Submarines
Head
Royal Corps of Naval Constructors
United Kingdom

19 Honorable Joan Dempsey
Deputy Assistant Secretary of Defense
(Intelligence and Security)
Office of the Secretary of Defense

20 Rear Admiral James L. Taylor, USN
Deputy Chief of Staff
Fleet Maintenance (N43)
Commander-in-Chief, U.S. Pacific Fleet

26 Lieutenant General Patrick Hughes, USA
Director
Defense Intelligence Agency

26 Dr. Benson Adams
Director
The Secretary of Defense Strategic Studies Group
Office of the Secretary of Defense
Strategic Study Group members

MARCH

4 Dr. Susan Bales
Director
Naval Science Assistance Program
Office of Naval Research

5 Rear Admiral Richard Michael Nutwell, USN
Deputy Commander
C^4ISR Systems Integration (SPAWAR 06)
Space and Naval Warfare Systems Command

6 Dr. Lance A. Davis
Deputy Director
Defense Research and Engineering
(Laboratory Management and Technology Transition)
Office of the Undersecretary of Defense (Acquisition & Technology)

Dr. Richard Chait
Director
Research and Laboratory Management
Office of the Assistant Secretary of the Army
(Research, Development and Acquisition)

Mr. Lewis L. Lundberg
Deputy Director
Navy Test and Evaluation and Technology Requirements
Office of the Chief of Naval Operations

Mr. Blaise J. Durante
Deputy Assistant Secretary of the Air Force
(Management Policy and ProgramAcquisition)
Office of the Assistant Secretary of the Air Force (Acquisition)
Vision 21 Team

10 Rear Admiral William Pickavance, USN
Chief
Information Systems Branch
Communication/Information Systems Division
Supreme Headquarters Allied Powers Europe

10–21 Mr. Safwat Elnahass
Head
Research and Development Department
Egyptian Air Force

APRIL

1 Rear Admiral James Taylor, USN
Deputy Chief of Staff
Fleet Maintenance (N43)
Commander-in-Chief, U.S. Pacific Fleet

21 Dr. Marv Langston
Deputy Assistant Secretary for C^4I/Space and
Electronic Warfare/Chief Information Officer
Office of the Secretary of the Navy

21–22 Rear Admiral Russell D. Moore, CCM, CD, RCN
Commander
Maritime Forces, Pacific
Canada

30 Dr. Charles Herzfeld
CNO Executive Panel
Office of the Chief of Naval Operations

MAY

7–8 Dr. Ann Miller
Director
Information Technologies
Office of theDirector of Defense Research and Engineering

13 Rear Admiral Daniel Murphy, USN
Director
Surface Warfare (N86)
Office of the Chief of Naval Operations

12–13 Dr. Marv Langston
Deputy Assistant Secretary for C^4I/Space and
Electronic Warfare/Department of the Navy
Chief Information Officer (Acting)
Office of the Secretary of the Navy

Rear Admiral Thomas J. Elliott, USN
Deputy Chief of Staff
Resources, Requirements and Assessment (N8)
Commander-in-Chief, U.S. Pacific Fleet

Mr. Tim Miller
Chief Information Officer
Naval Air Systems Command

Mr. Peter Brown
Chief Information Officer
Naval Sea Systems Command

13 Major General David A. Richwine, USMC
Assistant Chief of Staff
Command, Control Communications,
Computers and Intelligence (C^4I)/Director of Intelligence
Headquarters, U.S. Marine Corps

19 Major General Michael J. Williams, USMC
Commander
Marine Corps Systems Command

JUNE

19 Rear Admiral William L. Putnam, USN
Commander
Cruiser–Destroyer Group Three

27 Vice Admiral Thomas Fargo, USN
Commander
U.S. Naval Forces, Central Command/Commander
U.S. Fifth Fleet

JULY

9 Commodore M.D. MacPherson, RN
Director
Naval Operations
Royal Navy, United Kingdom

9 Lieutenant General Carlton W. Fulford, Jr., USMC
Commanding General
I Marine Expeditionary Force, Camp Pendleton

10 Mr. John King
Assistant Secretary of the Navy
(Financial Management and Comptroller)
Office of the Secretary of the Navy

21 General John Baker, AC
Chief
DefenceForce
Commonwealth of Australia

Rear Admiral Stephen Johnson, USN
Director
Tactical Support Systems (PD 15)
Space and Naval Warfare Systems Command/Commander
Naval Information Systems Management Center

22 Commodore Paul Stone, RN
Amphibious Warfare
Royal Navy, United Kingdom

Brigadier General Rob Fulton
Commander
Third Commando Brigade
Royal Marines, United Kingdom

24–25 Honorable John W. Douglass
Assistant Secretary of the Navy
(Research, Development and Acquisition)
Office of the Secretary of the Navy

25 Dr. Marv Langston
Deputy Assistant Secretary for C^4I/Space and
Electronic Warfare/Department of the Navy
Chief Information Officer (Acting)
Office of the Secretary of the Navy

Major General Edward Hanlon, USMC
Director
Expeditionary Warfare Division (N85)
Office of the Chief of Naval Operations

Vice Admiral William John Hancock, USN
Deputy Chief of Naval Operations for Logistics (N4)
Office of the Chief of Naval Operations

30 Rear Admiral Stephen H. Baker, USN
Commander
Operational Test and Evaluation Force

AUGUST

4 Rear Admiral Larry Poe, USN
Commander
Naval Intelligence Command

5 Rear Admiral Arthur "Bud" Langston, USN
Director
Navy Staff (N09B0
Office of the Chief of Naval Operations

14 Dr. Glen Tait
Professional Staff Member
Senate Armed Services Committee
U.S. Senate

18–19 Dr. Marv Langston
Deputy Assistant Secretary for C^4I/Space and
Electronic Warfare/Department of the Navy
Chief Information Officer (Acting)
Office of the Secretary of the Navy

Rear Admiral John A. Gauss, USN
Deputy Director
Engineering and Interoperability
Joint Interoperability Engineering Office
Defense Information Systems Agency

22 Dr. Timothy Coffey
Director of Research
Naval Research Laboratory

25 Mr. Hugh Montgomery
Director
Science and Technology Requirements Division (N911)
Office of the Chief of Naval Operations

SEPTEMBER

16 Major General John W. Hawley, USAF
Commander
Air and Space Command and Control Agency

18 Rear Admiral Rodney Rempt, USN
Program Executive Officer
Theatre Air Defense
Office of the Assistant Secretary of the Navy
(Research, Development and Acquisition)

Dr. Fred Saalfeld
Deputy Chief of Naval Research/
Technical Director
Office of the Chief of Naval Research

Dr. Susan Bales
Director
Naval Science Assistance Program

OCTOBER

6–7 Lieutenant General Jerome Granrud, USA (Ret.)
Lieutenant General Charles May, USAF (Ret.)
Rear Admiral Grant Sharp, USN (Ret.)
Rear Admiral Larry Vogt, USN (Ret.)
Joint Multiwarfare Analytical Game Participants

8 Vice Admiral Brent M. Bennitt, USN
Commander
Naval Air Force, U.S. Pacific Fleet

8 & 17 Rear Admiral David Brewer, USN
Commander
Amphibious Group Three

23–24 Rear Admiral P. Steven Muetstege (Dutch Navy)
Assistant Chief of Staff
Communications and Information Systems
Supreme Allied Commander, Atlantic

31 Admiral James R. Hogg, USN (Ret.)
Director
Strategic Studies Board
Office of the Chief of Naval Operations

Ms. Betty Welch
Deputy Assistant Secretary of the Navy
for Civilian Personnel and EEO
Office of the Assistant Secretary of the Navy

NOVEMBER

7 Rear Admiral Richard J. Nibe, USN
Deputy Director
Military Support
National Reconnaissance Office/Deputy Director
Operations (National Systems Support) (J35)
Joint Staff/Deputy Director
Defense Support Project Office

17 Vice Admiral Brent M. Bennitt, USN
Commander
Naval Air Force, U.S. Pacific Fleet

18 Rear Admiral (Select) John B. Totushek, USNR
Director
Environmental Protection, Safety and
Occupational Health Division (N45)
Office of the Chief of Naval Operations

DECEMBER

2 Dr. David Signori
Deputy Director
Warfare Information Technology
Defense Advanced Research Projects Agency

Dr. Marv Langston
Director
Information Systems Office
Defense Advanced Research Projects Agencysy

3–4 Rear Admiral John A. Gauss, USN
Deputy Director
Engineering and Interoperability
Joint Interoperability Engineering Office
Defense Information Systems Agency

4 Admiral James R. Hogg, USN (Ret.)
Director
Strategic StudiesGroup
Office of the Chief of Naval Operations

9 Dr. Dave Tennenhouse
Director
Information Technology Office
Defense Advanced Research Projects Agency

Mr. Ron Register
Deputy Director for Management
Defense Advanced Research Projects Agency

16 Rear Admiral John P. Davis, USN
Program Executive Officer for Submarines
Naval Sea Systems Command

Rear Admiral William H. Wright, USN
Director
Asia and Pacific Affairs
Office of the Assistant Secretary of Defense for
International Security Affairs

Appendix D
Major Conferences and Meetings

JANUARY

7–9 Navy Laboratory/Center Coordinating Group

7–9 Infrared Multi-Spectral Workshop

28 NRaD/National Security Industrial Association (NSIA) Executive Forum

FEBRUARY

4 Low Probability of Intercept/Communications Committee Information Meeting

4–6 Data Exchange Agreement 5655 Meeting With French Navy Delegation

5 The MITRE Corporation Board of Trustees Meeting

5–6 Military Satellite Communications Joint Planning and Management Tools Conference

10–13 Multifunctional Information Distribution System Steering Committee Meeting

10–14 Department of Defense Intelligence Information System Interoperability 97 Conference

12–13 Advanced Deployable System Acoustic Performance Processing Team Meeting

13–14 Naval Studies Board Modeling and Simulation Panel Meeting

18–20 Global Positioning System Joint Test Agency Working Group Meeting

MARCH

4–5 The Tactical Environmental Support System Next Century IPT Meeting

4–6 Assistant Secretary of the Navy (Research, Development and Acquisition) Silent Fury Working Group

5–6 Defense Advanced Research Projects Agency Integral Passive Workshop

10–13 American Defense Preparedness Association/National Security Industrial Association Joint Undersea Warfare Systems Conference

17–19 Acquisition Reform/DAWIA meeting

25–26 Non-Acoustic Sensor Technology Conference

25–27 Global Positioning System NAVWAR Evaluation Team Conference

27 NRaD/National Security Industrial Association Executive Forum

APRIL

1–3 Multifunction Electromagnetic Radiating System Advanced Technology Demonstration Integrated Product Team Meeting

7–11 Enhanced Littoral Battlespace Enhanced Combat Operations Working Group Meeting

7–11 Enhanced Littoral Battlespace Fires and Targeting Subgroup Meeting

8–9	Interservice Mission Planning Working Group Meeting
9–10	National Institute of Justice/Office of Science and Technology National Law Enforcement and Corrections Technology Center Directors' Meeting
14–18	Exploitation Technology Symposium '97
22–24	Armed Forces Communications and Electronics Association C4ISR Symposium
29–5/1	NAVSTAR Global Positioning System Combat Survivor Evader Locator Navigation Sensor System Interface Integrated Logistics Support Management Team Meeting

MAY

1–2	Professional Council of Federal Scientists and Engineers Spring Meeting
6–8	Unmanned Aerial Vehicles Joint Steering Technology Committee Meeting
12–13	Department of the Navy Chief Information Officer Board of Representatives Meeting
12–16	Copernicus Requirements Working Group Meeting
12–16	Global Positioning System Joint Program Office Source Selection Meeting
19–21	Department of Defense Physical Security Equipment Action Group Working Group Meeting
20–22	Generic Area Limitation Environment (GALE) Users' Conference
20–21	Integrated Ship Defense In Progress Review
21–22	Defense Management System Implementation and Planning Working Group Meeting
22	AN/UYQ–70 Users' Conference
28–29	Advisory Group on Electron Devices Working Group C/Space Technology Area Review Meeting

JUNE

3	NRaD/National Security Industrial Association (NSIA) Executive Forum
4–5	Navy Extremely High Frequency Operations Working Group
10	Telesonar Channel Measurements and Models Brief to Office of Naval Research
10–12	Crossbow Symposium
10–12	Naval Warfare Planning and Support Integration Project Operational Requirements Team/Joint Force Air Component Commander Kick-Off Meeting

24–26 Tactical Decision Making Under Stress Technical Advisory Board Meeting

JULY

1–2 Satellite Communications Tools Conference III

10 Third Annual Submarine Communications and C4I Systems Technology Conference

14–25 Naval Research Advisory Committee Summer Study

15–16 Tactical Sensor Technology Workshop

30–31 Aggregate Level Simulation Protocol Interface Work Group Meeting

30–31 Electrooptical Propagation Assessment in Coastal Environments Workshop

AUGUST

4–8 Naval Intelligence Security Awareness Conference

5–6 Link–16 Integrated Product Team/Engineering Panel Working Group Meeting

5–7 Office of Naval Research Passive Sonar Signal Processing Program Peer Review

6–7 Carl Vinson/Essex D–16 Conference

18–22 Sixth Annual American Institute of Aeronautics and Astronautics/Ballistic Missile Defense Organization Conference

SEPTEMBER

4 Miniaturized Airborne Global Positioning System Receiver Follow On Meeting

11 Naval Warfare Tactical Database Requirements Working Group Meeting

16–19 Integrated Broadcast Service Joint Users Working Group Conference

OCTOBER

6 Joint Multi-Warfare Analytical Game 97–2 De-Brief

7 NRaD/National Security Industrial Association (NSIA) Executive Forum

7–8 Satellite Communications Tools Conference

14–16 Multifunctional Information Distribution System Steering Group Meeting

15 Central Measurement and Signal Intelligence Technical Coordinating Office Meeting

15–16 Link–16 Users Conference

16–17 Tactical Environmental Support System Next Centruy In-Process Review

21–22 Office of General Counsel Field Counsel Conference

30–31 US/UK Cooperation Global Positioning System Working Group

NOVEMBER

3–6 Spectroradiometric Science Symposium

4–6 Global Positioning System Integrated Logistic Support Working Group Meeting

12 Carrier of the Future Systems Engineering Master Plan Focus Meeting

13 Natural Resources Managers Conference

13–14 Joint Data Modeling Working Group Meeting

18 Multifunctional Information Distribution System Integrated Test and Training Meeting

18–20 Contractor SAP/SAR Security Working Group Meeting

DECEMBER

1–2 The Technical Cooperation Program Maritime Systems Group Meeting

2–4 Battlespace Atmospherics Conference

2–4 Department of the Navy Chief Information Officer Naval Virtual Intranet IPT Meeting

2–4 Naval Warfare Planning and Support Meeting

2–5 NATO Research Study Group-24 Human Engineering Testing and Evaluation Meeting

4 National Defense Industrial Association Strike, Surface and Anti-War Committee Meeting

9 Joint Forces Air Component Commander Briefing

9 Defense Advanced Research Projects Agency Counter Sniper Briefing

9–10 Vector Signal Image Processing Working Group Meeting

10 Foreign Military Sales International Programs Symposium

10–11 Electro Magnetic Matched-Field Processing Meeting

Acronyms

ABFC	Advanced Base Functional Component
ACB	Allied Communications Publication
ACDS	Advanced Combat Direction System
ADCU	Auxiliary Display Control Unit
ADS	Air Deconfliction System
ADNS	Automated Digital Network System
AdVISR	Advanced Virtual Intelligence, Surveillance, and Reconnaissance
AEGIS	Airborne Early Warning/Ground Integration Segment
AEM/S	Advanced Enclosed Mast/Sensor
AFWTF	Atlantic Fleet Weapons Training Facility
AOR	area of responsibility
APS	Advanced Planning System
AREPS	Advanced Refractive Effects Prediction System
ASE	amplified spontaneous emission
ATO	air tasking orders
AUV	autonomous undersea vehicle
AWE	Advanced Warfighting Experiment
BAAs	Broad Agency Announcements
BESEP	base electronic system engineering plan
BLII	base Level Information Infrastructure
BLOS	Beyond Line-Of-Sight
BRAC	Base Closure and Realignment
C^3	Command, Control, and Communications
C^4	Command, control, communications and computers
C^4I	Command, Control, Communications, Computers and Intelligence
C^4ISR	Command, control, communications, computers, intelligence, surveillance, and reconnaissance
C6F	Commander, Sixth Fleet
CA	Challenge Athena
CAFMS	Computer Aided Force Management System
CaNDI	COTS and NDI
CARIBROC	Caribbean Regional Operations Center
CEA	Central Engineering Activity
CCARnet	Command and Control Advanced Research Network
CCN-II	Central Communications Network Upgrade program
CCSF	Consolidated CARIBROC Support Facility
CFS	Canadian Forces Station Services
CIFF	Central identification friend or foe
CINC	Commander in Chief
CINCLANTFLT	Commander in Chief, U.S. Atlantic Fleet
CINCPACFLT	Commander in Chief, U.S. Pacific Fleet
CINCUSNAVEUR	Commander in Chief, U.S. Naval Forces Europe

CJTF	Commander joint task force
CM	Configuration management
CMF	Consolidated Maintenance Facility
CNO	Chief of Naval Operations
CNMOC	Commander Naval Meteorology and Oceanography Command
COMDAR	Common Data Repository
COMPASS	Common Operational Modeling, Planning, and Simulation Strategy
COMNAVTELCOM	Commander, Naval Telecommunications Command
COMOPTEVFOR	Commander Operational Test and Evaluation Force
CONUS	Continental U.S.
COTS	Commercial off-the-shelf
CRADA	Cooperative Research And Development Agreement
CRF	Cryptographic Repair Facility
CSS	Combat Service Support
CSS-C^2S	CSS command and control system
CTAPS	Contingency Theater Automated Planning System
CTL	Candidate target list
CTOC SW	Cryptologic Technician Operations Chief [Surface Warfare]
CUB	Cryptologic Unified Build
CWAN	Coalition wide area network
CWL	Commandant's Warfighting Laboratory
DAMA	Demand Assigned Multiple Access
DARPA	Defense Advanced Research Projects Agency
dB	decibels
DCP	distributed collaborative planning
DII	Defense Information Infrastructure
DIS	distributed interactive simulation
DRVDD	Digital Radar Video Data Distribution System
DTED	Digital Terrain Elevation Data
DTC	desk top computer
DTS	Defense Travel System
E&MD	Engineering and manufacturing development
EASTPAC	Eastern Pacific
ECOC	Enhanced Combat Operations Center
EGI	Embedded GPS Inertial
EMCON	Emission control
ExInit	Exercise Initialization
xBAIT	Experimental Battlespace Agents and Instrumentation Toolkit
XTP	Express transfer protocol
FM	frequency modulation
FORACS	Fleet Operational Readiness Accuracy Check Sites
GCCS 2.1	Global Command and Control System Version 2.1
GEP	Geo-acoustic Echo Processor
GPS	Global Positioning System
GPS JPO	Global Positioning System Joint Program Office
GVRC	GPS Versa Module EuroCard [VME] Receiver Card

HF	high frequency
HFRG	High-frequency Receiver Group
HPCC	High-Performance Computing Center
IFF	Identification friend or foe
IFOGs	Interferometric fiber-optic gyroscopes
ILA	Integrated logistics assessment
INMARSAT	International Maritime Satellite
IOC	Initial operating capability
IP	Internet protocol
IPT	Integrated Process Team
IREPS	Integrated Refractive Effects Prediction System
ISEA	In-service engineering activity
ISTEF	Innovative Science and Technology Experimentation Facility
IT–21	Information Technology for the 21st Century
JARCC	Joint Air Reconnaissance Control Center
JAT	Joint acceptance test
JCS	Joint Chiefs of Staff
JDISS	Joint Deployable Intelligence Support System
JEDI	JAVA engineering, development, and integration
JFACC	Joint Force Air Component Commander
JIC	Joint intelligence center
JMCIS	Joint Maritime Command Information System
JMCOMS	Joint Maritime Communications Strategy
JSA	Joint security area
JTFEX	Joint Task Force Exercise
JWID	Joint Warrior Interoperability Demonstration
km	kilometer
LAN	local area networks
LAN/WAN	local area network/wide area network
LMDS	Light-Weight Modular Display System
MAGTF	Marine Air Ground Task Force
MANTECH	Manufacturing Technology
MAST	Mobile Ashore Support Terminal
MBC	Maritime Battle Center
MBL	Maritime Battle Lab
MCAGCC	Marine Corps Air Ground Combat Center
MCAS	Multi-Channel Acoustic Simulator
MCIXS	Mobile Command Information Data System
MCTSSA	Marine Corps Tactical systems Support Activity
MDARS	Mobile Detection Assessment Response System
MEDEVAC	Medical evacuation
METOC	Metrology and Oceanographic
MIUW	Mobile Inshore Undersea Warfare
MMATS	Marine Mammal Acoustic Tracking System
MOSC	Modeling & Simulation Operations Support Cell

MRSS	Multiple Radar Simulators System
M/S	Modeling, simulation
M&S	Modeling and Simulation
MTF	Medical treatment facilities
NATO	North Atlantic Treaty Organization
NAVAIR	Naval Air Systems Command
NAVMACS II	Naval Modular Automated Communications System II
NAVMASSO	Navy Management Systems Support Office
NAVSEA	Naval Sea Systems Command
NCCOSC	Naval Command, Control and Ocean Surveillance Center
NCTAMS	Naval Computer Telecommunications Area Master Station
NDIA	National Defense Industrial Association
NIPRNET	Nonclassified Internet protocol router network
NISE East	NCCOSC In-Service Engineering, East Coast Division
NPDM	Navy program decision meeting
NRaD	NCCOSC RDT&E Division
NTCSS	Non-Tactical Command Support System
NTIP	Naval Technology Insertion Program
ONR	Office of Naval Research
OPiS	Online Procurement Information System
OPEVAL	Operational evaluation
OSS	Ocean survey system
OT	operational test
OTDR	Optical time-domain reflectometer
PALT	Procurement Administrative Lead Time
PEO TAD	Program Executive Office Theater Air Defense
PCS	personal communications service
PMTC	Pacific Missile Test Center
PMRF	Pacific Missile Range Facility
PSG	Peripheral Support Group
PSM	Personnel Status Monitor
RAAP	Rapid Application of Air Power
RBE	Radar broadcast equipment
R&D	Research and development
RLBTS	Reconfigurable Land-Based Test Site
RMMS	Remote maintenance and monitoring subsystems
ROC	Required Operational Capabilities
ROV	Remotely operated vehicle
RPOT	Radio Propagation Over Terrain
RRTS	Rapid Request Tracking System
RSC	Radar Scan Converter
SABER	Situational Awareness Beacon with Reply
SACLANT	Supreme Allied Commander Atlantic
SATCOM	Satellite communications
SBBL	Sea Based Battle Lab

SBIR	Small Business Innovation Research
SEI	Systems Engineering and Integration
SHF	Super high frequency
SIE	Systems Integration Environment
SIPRNET	Secure Internet Protocol Router Network
SMART	Shipboard Modular Arrangement Reconfiguration Technology
SPAWAR.	Space and Naval Warfare Systems Command
SQUIDs	Superconducting Quantum Interference Devices
SSA	Software support activity
SSC San Diego	Space and Naval Warfare Systems Center San Diego
SWBTA	Shoalwater Bay Training Area
TAC	Tactical Advanced Computer
TACINTEL	Tactical Intelligence
TADIL	Tactical digital information link
TBMCS	Theater Battle Management Core System
TCP	Transmission control protocol
TCS/UAV	Tactical Control System/Unmanned Air Vehicles
TDC	Tactical Display Consoles
TECHEVAL	Technical evaluation
TLCF	TACINTEL Link Control Facility
TG	Task Group
TT'97	Tandem Thrust '97
UE	User Equipment
UHF	Ultra high Frequency
URMTT	Universal Radar Moving Target Transponder
USACOM	U.S. Atlantic Command
USAF	U.S. Air Force
USMC	U.S. Marine Corps
USMTF	United States military text format
USPACOM	U.S. Pacific Command
VME	Versa Module EuroCard
VMEC	versa module eurocard chassis
VHF	very high-frequency
VICS	Versabus Modular Eurocard Integrated Communications System
WESTPAC	Western Pacific
WISS	Weapons Impact Scoring System

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OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	January 1998	Jan 1997 – Dec 1997

4. TITLE AND SUBTITLE
SSC SAN DIEGO COMMAND HISTORY
Calendar Year 1997

5. FUNDING NUMBERS
In-house

6. AUTHOR(S)
Technical Information Division

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Space and Naval Warfare Systems Center
San Diego, CA 92152–5001

8. PERFORMING ORGANIZATION REPORT NUMBER
TD 2985

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Space and Naval Warfare Systems Center
San Diego, CA 92152–5001

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The activities and accomplishments of NCCOSC RDT&E Division/SSC San Diego during CY 1997 are described and the Center's mission and responsibilities delineated.

14. SUBJECT TERMS
command and control
communications
marine mammals
navigation
intelligence, surveillance, and reconnaissance
Fleet engineering
ocean engineering

15. NUMBER OF PAGES
122

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	SAME AS REPORT

21a. NAME OF RESPONSIBLE INDIVIDUAL	21b. TELEPHONE *(include Area Code)*	21c. OFFICE SYMBOL
E. R. Ratliff	(619) 553–4806 e–mail: ratliff@spawar.navy.mil	Code D0271

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(Code N09BH)
Washington, DC 20350–2000 (2)

Space and Naval Warfare Systems Command
(Code 00L)
San Diego, CA 92110–3127